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SESSIONAL PAPERS

SECOND SESSION, FOURTEENTH PARLIAMENT

OF THE

PROVINCE OF BRITISH COLUMBIA

SESSION 1918

VOLUME TWO

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
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CONTENTS.

VOLUME 2. PAGE.

PAPERS PRESENTED:

Report on Acts of 1917 ..... R 1

REPORTS, OFFICIAL:

Agricultural Department ..... N 1
Board of Health ..... G 1
Department of Railways ..... S 1
Fisheries Commissioner ..... Q 1
Forest Branch ..... I 1
Land Settlement Board ..... L 1
Mental Hospitals ..... M 1
Minister of Lands ..... H 1
Printing Office ..... R 13
Provincial Museum ..... O 1
Superintendent of Insurance ..... P 1
Water Rights Branch ..... J 1
Workmen's Compensation Board ..... K 1

8 D 20 Prov. Lib. Rp. 1918², Cont.

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TWENTY-FIRST ANNUAL REPORT

OF THE

PROVINCIAL BOARD OF HEALTH

INCLUDING

SIXTH ANNUAL REPORT OF MEDICAL INSPECTION OF PUBLIC SCHOOLS AND
THE FORTY-FIFTH ANNUAL REPORT OF VITAL STATISTICS
DEPARTMENT FOR THE YEAR ENDING
DECEMBER 31ST, 1917

AND

PROCEEDINGS OF THE SECOND MEETING OF MEDICAL OFFICERS OF HEALTH
OF BRITISH COLUMBIA HELD IN VANCOUVER, B.C.,
SEPTEMBER 12TH AND 13TH, 1917

PRINTED BY
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PROVINCIAL BOARD OF HEALTH,

VICTORIA, B.C., April 1st, 1918.

To His Honour Sir FRANK STILLMAN BARNARD, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The undersigned has the honour to present the Twenty-first Annual Report of the Department of Public Health for the year ended December 31st, 1917.

J. D. MACLEAN,

Provincial Secretary.

REPORT

OF THE

PROVINCIAL BOARD OF HEALTH.

PROVINCIAL BOARD OF HEALTH,
VICTORIA, B.C., February 12th, 1918.

Doctor the Honourable J. D. MacLean,
Provincial Secretary, Victoria, B.C.

SIR,—I have the honour to submit the Twenty-first Annual Report of the Provincial Board of Health being for the year 1917.

Before proceeding to lay the facts before you concerning the activities of the Board during the past year I would respectfully request your consideration of a change of the time for the presentation of the Annual Report. Under our present regulations we are obliged to present the annual report at the meeting of the Legislature. In this Province the practice has been for the Legislature to meet about the second week in January. Under the circumstances it is difficult for the Department to present a report in a way that would permit of analysis of the returns received from the different sections of the Province. We have been obliged, as regards the Vital Statistics Branch, to note annually that returns have not been received from certain outlying districts; this not because of any fault on the part of the officials at these points, but owing to distance and uncertainty of the mail service. If the year embraced in the report was made to terminate the end of June, then our reports, particularly of the Vital Statistics Branch and the Medical Inspection of Schools, could be dealt with much more fully, comparisons made with the returns of the former year, and benefits noted. As it is, first, our returns are not complete, and, second, sufficient time is not allowed for other work in connection with them than their compilation for the report. The practice in the different States in the United States and in the other Provinces of Canada is to allow sufficient time from the beginning of the year to permit of a proper analysis of the facts submitted by the officials in the different departments.

I am very much pleased to say that reports of the health conditions during the year 1917 deal more with the work which has been done along educational lines rather than a report of a series of epidemics. The health of the community has been exceptionally good. There have been no alarming reports during the year, yet such conditions may not continue. It is consequently better to be always prepared to act promptly in the matter of preventive measures in any emergency which may arise. Your Board recognizes the importance of this fact and are devoting their efforts to the promotion of the interest of the public at large in health matters. The time seems to be most opportune for stimulating the attention of the public to the teachings of the Board of Health. The universal enforcement of health regulations by the military authorities upon the troops in their charge and the beneficial results that have been obtained has brought forcibly home to the people the fact that the health authorities are not faddists when they say that disease can be prevented. Our troops have been living under conditions which in normal times would not be tolerated in any community. They have been subjected to intense physical strain, irregular hours, irregular meals, and insanitary conditions of living, yet by the strict enforcement of sanitary measures and the insistence upon inoculation against disease results have been brought about that have demonstrated conclusively the truth of the teachings of the health authorities, and has done more to rivet the attention of the public in a short time than could have been accomplished by another quarter of a century of patient teaching under normal conditions. With these results before us we have been able to direct the attention of the people to and to have awakened a lively interest in health questions. We were first shown by the rejection of men presenting themselves for service that there was unfortunately a very large percentage of men unfit for military service owing to physical defects. Secondly, we were shown that the health of the men who were accepted was much better under the enforcement of military health regulations, when the man was living under the highest pressure of effort, both mental and physical, than it would have been under previous conditions in civil life.

Consideration of these aspects of health-work has naturally led the people to a serious consideration of the influence of the individual as regards his relation to the community and his environment, and as regards the efforts that he must make individually to help in prevention of disease by attention to personal hygiene and education of himself and others in the idea of prevention of disease as distinct from its cause. The Department has taken advantage of the change in public opinion and is endeavouring in every way possible to provide information through societies by way of distribution of pamphlets, the enforcement of recording of contagious diseases, and by endeavouring to enlist the active interest of the medical profession in the health propaganda. With this object in view a meeting was called of the Medical Health Officers for the discussion of health subjects and to listen to papers read on pertinent subjects. The meeting was held in Vancouver in September, 1917, the sessions lasting for two days, and the interest manifested by those who attended was very gratifying. The Department feels under a very great obligation to the members who presented their papers, and particularly to President Wesbrook, of the University of British Columbia, for the great interest he took and the assistance he gave towards making the meeting a success.

One of the first results that we have obtained from this meeting, which is particularly gratifying to the Department, is the increased interest manifested by the members of the profession in their work, and particularly so as regards the reports of the conditions in their districts. The reports have been much fuller and the comments made more general, making the reports differ very much from those that we previously received, which as a rule were more of a record of cases that had occurred. Causes are discussed and suggestions made.

I have also to acknowledge, with appreciation, the increased interest which has been taken in the question of health and the activities of the Board by the members of the Women's Institutes. They have evinced a very serious and earnest desire to co-operate with the Board, and I had the honour to meet and address the institute on three different occasions on health matters. The members of the institute expressed a desire to keep in touch with the Board and to further health interests in the localities by giving the matters their personal attention.

The health of the Province for the year has been very satisfactory; so much so as to cause very favourable comments from those who are acquainted with the returns made by our Health Officers.

MEASLES.

During last year I had to deal at some length with the history of an epidemic of measles which occurred at the end of the year and was continued on into 1917. The greatest number reported was from the City of Victoria—some 3,000 cases in the city and the districts around. We cannot emphasize too strongly the fact that measles is the most prevalent and one of the most infectious of diseases, and one, from a health point of view, that is the most difficult to deal with. Unfortunately the public look upon measles as a very minor trouble, and their chief concern seems to be, when an epidemic does come, for all their children to have it and get it over with. This is very much to be regretted, and it is to be regretted that the general public, and even physicians, discount the seriousness of the disease. The danger lies not so much in the effect of the attack itself upon the child, but with the troubles that follow it, such as bronchopneumonia, eye and ear affections, and deaf mutism.

INFANTILE PARALYSIS.

Some concern was felt during the latter part of the summer, when reports of cases of infantile paralysis began to come in, in view of the great epidemic in the Eastern States in 1916. Fear was expressed that it had come to the West and that we would suffer proportionately as they had done. Fortunately the number of cases reported did not exceed those we might expect according to the number of population; in fact, thirty-seven cases in all were reported, thirty of which were in and around Vancouver. Prompt measures were taken by Dr. Underhill, Medical Health Officer in Vancouver, and with the knowledge we have of his efficient management no alarm was felt as to the outcome.

SMALLPOX.

During the past year there were a larger number of cases of smallpox reported as compared with 1916. In 1916 there were seven cases, as against sixty in 1917. The increase was accounted for by an epidemic at Grand Forks, forty-eight cases being reported. The cases were mild, with no deaths. It originated from one of the logging camps south of the border. Grand Forks, as

the gateway for the Boundary country, has always been susceptible to slight epidemics. There were ten cases reported from the City of Vancouver; eight of these occurred during the early part of the year amongst stevedores and was due to infection from a ship from the Orient. These cases were severe, of the confluent type, and resulted in fatalities. Prompt measures were taken by Dr. Underhill, Medical Health Officer of Vancouver City, and the disease was confined to the eight cases. There was one case reported in North Vancouver and one in Victoria City.

The presence of smallpox led to some agitation on the question of vaccination, anti-vaccinationists entering a protest as regards its enforcement. I would point out, however, that while we have enjoyed particular immunity from smallpox, yet at the same time this immunity is leading to carelessness in carrying on vaccination in the children, and when an epidemic does arrive the results will be unfortunate. That such an epidemic is possible and liable to be of a serious character is shown by the nature of the eight cases referred to above that were imported from the Orient.

Tuberculosis.

Tuberculosis is not hereditary; not incurable; it is contagious; it is preventable; and under certain conditions curable. The recognition of these facts, for they are facts, has been brought about by the careful study of the disease, by a careful study of the different methods of treatment, and will form a basis for the work undertaken by the Provincial Board of Health in its efforts to combat the disease. This question was discussed in our last Annual Report, and I am pleased to say that, under the direction of the Honourable the Provincial Secretary, Dr. MacLean, greater efforts are to be made for the future.

The sanatorium which was established at Tranquille has been doing splendid work, but this work is handicapped by the fact that they have been overloaded with advanced cases, with a result that accommodation is lacking for the early and curable cases. Dr. MacLean proposes to use local hospitals throughout the Province as centres for the handling of the cases in their immediate vicinity. The Government will increase the *per capita* grant to hospitals for these cases to $1 per day. Hospitals will be required to provide one-tenth of their bed accommodation for advanced cases. Tuberculosis is a reportable disease, and provision is to be made for the reporting of all cases by the medical men, to whom a small fee will be allowed for the work. A travelling Medical Officer of Health is to be employed for the work of supervision and to act as a consultant for the local Medical Officers of Health. There is to be established, with the co-operation of the Dominion Government, another sanatorium in the Province. This will be primarily for the care of the returned soldiers suffering from tuberculosis, but will ultimately revert to the Province. An effort will be made to stimulate public interest in the matter and a general campaign of education carried on. The expectation is that the public will be fully impressed with the fact that the disease is contagious, but more especially that it is preventable. Doubtful cases will be noted and can be kept under observation, and the beds of the sanatorium will be kept for cases in the early stages that, under sanatorium treatment, can be cured.

The danger of infection from tuberculosis is much greater during childhood, and I would strongly recommend the advisability of concentrating as far as possible our efforts in guarding our children and to assist the child-welfare movement which is being organized in British Columbia. I would suggest that the School Boards of British Columbia, particularly in the cities, establish open-air school-rooms for weakly and pre-tubercular children. The establishing of such school-rooms is long past the experimental stage, and the results obtained from treatment by this means of such children in the Eastern schools are such as to justify an immediate adoption of the same plan in British Columbia.

Venereal Diseases.

The wastage of life in this war is rousing the public conscience in all nations to an extent where a solution has to be found for many of the cases which have been productive of serious loss of life and more particularly of efficiency in our population. Tuberculosis has been actively discussed by the people, but a false sense of modesty, false inasmuch as the health of the people is so fatally affected, has in the past prevented public attention being directed to the ravages caused by venereal diseases. Those who have closely studied the spread of such diseases point out that it is necessary, if widespread relief is to be obtained, for the public to be made to apprehend the imminence of the danger. The Governments in the different countries are acting in the matter, and while, as yet, there has not been arrived at a basis for conformity of action,

yet I would recommend to your serious consideration the conclusions arrived at by the Committee on Public Health of the Conservation Commission of Canada, which committee is of the opinion that legislation should be enacted providing for:—

(1.) Registration of cases without name and address:
(2.) Public registration and isolation of recalcitrants:
(3.) Free treatment for all who apply for it:
(4.) Free bacteriological and blood tests:
(5.) Supervision of mental defects:
(6.) The administration of the plan by a Dominion body through or in co-operation with Provincial Boards of Health.

In the recommendation made by the Royal Commission appointed by the Government of Great Britain I would especially recommend to your attention their recommendation for "The necessity of educating the public to the gravity of the effect of the disease by securing the constant assistance of voluntary agencies engaged in prevention and rescue work." Such work has been begun in British Columbia, and I would especially mention and recommend the work of the Life Conservation League of Victoria City. This League has evinced an active interest in the matter, and through the press, the pulpit, and public meetings is endeavouring to arouse public conscience to the gravity of the situation.

WATER.

A very important question came before the Board during the past year affecting the water-supply of the City and District of North Vancouver and the City of Vancouver and adjoining municipalities, which get their water from the same sources. In 1905 reservations were placed upon the watersheds by the Government reserving all alienated lands within the bounds of the watersheds. Unfortunately alienations had been made previous to this by lumber and mining companies. Their holdings had lain dormant until the last year, when they began active operations. As they were in possession of certain portions of the watersheds, the Board of Health was asked to take such measures as would safeguard the water-supply. Conferences were held with the Government and as a result arrangements were arrived at. Regulations governing the companies working on the watersheds were issued, an Inspector was appointed, and every effort was made to safeguard the health of the community. From the measures taken there is no doubt that this will be done, but I beg leave to suggest that the whole question of the watersheds for the Burrard Peninsula be dealt with as a whole; that a Water Board be established along similar lines to the present Sewerage Board of Vancouver, having control of the watershed, the supply and the distribution of the water.

During the year plans for the following were examined and approved:—

Sewerage plans: Vancouver Trunk Sewer, Trail, and B.C. Sulphite Co., of Howe Sound.
Water-supplies: Revelstoke and Trail.
Cemetery-sites: Okanagan Mission, Squamish, Fort George, Duncan, and Mapes.

Three hundred and eighty-five doses of typhoid vaccine, 1,280 vaccine points for vaccination, and 658,000 units of antitoxin were distributed.

Work for the Provincial Laboratory was done for us by the laboratory of the Vancouver General Hospital, and I have to thank Dr. Mullin, who is in charge, for the very full reports which we received of the work that he did for us. The Provincial Laboratory was not in use owing to the fact that we had been unable to secure the services of a bacteriologist, and also to the fact that the Honourable the Provincial Secretary had under consideration a rearrangement of this work.

We append a table showing returns made by Medical Health Officers of cases of contagious in the different parts of the Province. I am also incorporating reports from the Vital Statistics Branch, Sanitary Inspection, Hospitals Inspection, and the School Report. The matters more particularly in connection with these inspections are dealt with in the reports.

I would commend to your favourable notice the great interest which is taken in the work of the Department by all the members of the staff.

I have the honour to be,
Sir,
Your obedient servant.

H. E. YOUNG, M.D.,
Secretary, Provincial Board of Health.

TABLE SHOWING RETURNS OF CASES OF CONTAGIONS IN THE PROVINCE.

District.	Infantile Paralysis.		Tuberculosis.		Mumps.		Leprosy.		Typhoid Fever.		Scarlet Fever.		Smallpox.		Diphtheria.		Chicken-pox.		Whooping-cough.		Scarlatina.		Erysipelas.		Measles.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Abbotsford									2																	
Agassiz							1	1																		
Alberni City			10						1																3	
Anyox									1																	
Armstrong City	2																									
Ashcroft			2																							
Barnston Island	1																									
Blaine, Wash. (near)	1																									
Britannia Beach																	4		1						70	
Burnaby Municipality			3	1					1		10						94		4		3				43	
Chase									8	1															2	
Chilliwack									3																	
Clinton			1																						1	
Coquitlam Municipality									2																	
Cowichan Municipality																									18	
Creston			2	1															20						85	
Cumberland City			7																				2			
Duncan City																	1									
Esquimalt Municipality																	6								110	
Fernie City									21		1														9	
Field																									8	
Floodville			1	1																						
Ganges															1											
Grand Forks			1	1					7		6	2	48												244	2
Hedley									1																	
Hope									1																13	
Islands, The																									1	
Kelowna City			4	4					2																	
Keremeos																									25	
Lillooet																									5	
Lucerne			1																						1	
Lytton																									2	
Masset											1															
Matsqui Municipality			2						1		2								18						6	
Merritt																			1						86	
Mission Municipality			5						2		3														15	
Nanaimo City									3						18	2										
Needles																	1									
Nelson City											4								24						4	
North Bend	1																									
Peachland Municipality																										
Phoenix City			2						2																5	
Point Grey Municipality	2								1		20				1		48		9				1		14	
Port Essington																										
Port Hammond	1																									
Port Simpson																										
Carried forward	8		41	8			1	1	59	1	47	2	48		20	2	154		77		3		2		770	2

TABLE SHOWING RETURNS OF CASES OF CONTAGIONS IN THE PROVINCE—*Concluded.*

District.	Infantile Paralysis.		Tubercu-losis.		Mumps.		Leprosy.		Typhoid Fever.		Scarlet Fever.		Smallpox.		Diphthe-ria.		Chicken-pox.		Whooping-cough.		Scarla-tina.		Erysipe-las.		Measles.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Brought forward	8	.....	41	8	.....	.....	1	1	59	1	47	2	48	.....	20	2	154	.....	77	.....	3	.....	2	.....	770	2
Prince Rupert City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19	.....	146	.....	.....	.....	1	.....	3	.....
Princeton	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	99	.....
Revelstoke City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Richmond Municipality	.....	.....	.....	.....	10	.....	.....	.....	1	.....	8	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Saanich Municipality	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	600	.....
Sidney	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....
Smithers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....
Sooke	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	2	.....	.....	.....	.....	.....	1	.....
Summerland Municipality	.....	.....	6	5	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vancouver City	20	.....	288	158	386	.....	.....	.....	80	2	131	2	10	3	73	10	286	.....	84	3	.....	.....	.....	.....	222	1
Vancouver, North	.....	.....	1	.....	.....	.....	.....	.....	2	1	19	1	1	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	30	.....
Vancouver, South	8	1	23	12	.....	.....	.....	.....	2	.....	38	1	.....	.....	6	.....	102	.....	9	1	.....	.....	.....	.....	192	1
Vernon City	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Victoria City	1	.....	69	37	.....	.....	2	.....	12	1	20	.....	1	.....	44	2	12	.....	4	.....	.....	.....	.....	.....	2300	.....
West Coast	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Yale	.....	.....	1	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	37	1	429	216	396	.....	3	1	125	6	269	6	60	3	143	14	605	.....	328	4	3	.....	4	.....	4234	4

GENERAL REPORTS.

SANITARY INSPECTION.

VICTORIA, B.C., February 1st, 1918.

H. E. Young, M.D.,
Secretary, Provincial Board of Health, Victoria, B.C.

SIR,—In presenting the Seventh Annual Report pertaining to the work of sanitary inspection for the year ending, I beg to preface it by reminding you of the fact that this branch of the public health service was the first to suffer in man-power through war conditions, and as each member of the staff removes the vacancy still remains as such, in the hopes of an early termination of the great conflict, when it is presumed that the staff may regain its original strength. Much extra time and labour has been pressed upon the remnant left to carry on the service: in the meantime industrial development has made such strides, as predicted in my last report, that to-day there are 100,000 people employed outside of the cities and in what has been fitly termed the vast "outdoors" of British Columbia. The larger part of these new industries are located near tide-water on islands or inlets, many of them off the regular traffic routes. For reasons already given the sanitary welfare of these numerous industrial camps has not received the desired attention during the past two years, although in the Interior sanitary-inspection work has been attended to by the Provincial police, who are ex-officio Sanitary Inspectors. Complaints have been numerous and reference made in the press, one editorial of a widely circulated "daily" pointing out most emphatically that in view of the expansion taking place some more adequate measure of sanitary welfare for logging and other camps is imperatively necessary. This is undoubtedly true, and is further emphasized by the records of the large city hospitals, which show that the majority of typhoid and other infections come from the outside districts, where conditions are conducive to the spread of infection. Through the efforts of the Honourable the Provincial Secretary means are being provided whereby a thorough and persistent campaign will be taken up for enforcing the regulations dealing with such conditions.

Among the numerous new industrial enterprises under way and in contemplation, mention should be made of what promises to be the largest pulp and paper mills in the world, located at Port Alice, Quatsino Sound. Others have been brought into operation at Port Mellon, Swanson Bay, and Ocean Falls. The Powell River plant is operated at capacity limit, and the B.C. Sulphite Co., at Howe Sound, are enlarging to double present capacity. A large number of copper and zinc properties are being developed at different points, whilst the logging industry is only limited by labour procurable. Spruce and fir to the amount of $50,000,000 has been contracted for by the Munitions Department, in addition to an increased commercial demand. Space forbids enumerating to any extent the tremendous development going on, and I have merely mentioned facts to show the necessity of providing means and ways to protect and promote health conditions at the points selected for the industrial camps in unorganized territory, where no governmental supervision exists beyond the nearest Provincial constable or Government Agency, sometimes one or two days' travel distant. However, the men behind these large enterprises are shrewd enough to recognize the fundamental value of selecting sanitary sites for the housing of their employees. The Powell River Townsite is a good sample of such foresight. The larger the enterprise the less trouble for our Inspectors in enforcing the Provincial regulations. With few exceptions, the small and medium-size camp operators, employing from 10 to 100 men, are the most difficult to convince of the necessity of observing sanitary regulations. The greatest outstanding feature to the credit of all employers operating camps with kitchen and bunk-houses is the fact that without exception the food provided is the best obtainable and without stint. In the past we have not had occasion to give much credit for the manner of housing and other comforts provided to employees in the small camps. In future a greater consideration in that respect will be demanded. Another need for all camps is educational pamphlets dealing with the increasing prevalence of syphilis, also the value of typhoid prophylactic inoculation, and for the rural settlements similar literature or posters for the attention of parents, guardians, and school-teachers in reference to prevention of common ailments common

to children; and again I would respectfully suggest that an amendment be made to the "Land Act," prohibiting the registration of any subdivision for townsite or residential purposes until the approval of the Provincial Board of Health has been obtained. The lack of such is shown in the almost insurmountable insanitary conditions of several of our newer towns established during the late boom. Such an amendment would prevent "history repeating itself" in that respect; furthermore, our sister Provinces and States have adopted such legislation. The State of California provides that all land sold or subdivided for residential use must be provided with pure water-supply, facilities for sewage-disposal, graded streets, lanes, and approved sidewalks.

During the early part of 1918 the service of this Department was invoked for the purpose of protecting a community from the serious endangering of a water-supply through the inefficiency of a supposedly well-designed and built septic system used for the drainage from a large institution. One fatal case of typhoid had already occurred. Upon investigation it was found, first, that the septic action of the tanks had been nullified by the lack of grease-traps; second, no provision had been made for rest and clean-outs; third and worst feature was the fact that the outlet from tanks was straight to a fresh-water stream used by neighbours for domestic purposes. The first and second defects were remedied in the usual manner, and a well-laid sub-irrigation system adopted for the discharge, the old discharge-pipe being removed entirely. The results have been very satisfactory.

At Vernon during the past few years the residents of a splendidly improved farming community have been subject to a nuisance caused by the periodical removal of sludge from the tanks of a sewage plant owned by the city. The Government was petitioned and the matter was placed with this Department for attention. Arrangements were made with the city authorities that I should be on hand during the next clearing operation. This was done, with the results that by suggested minor changes in equipment and method the nuisance has been eliminated 90 per cent. and the cost of operation likewise reduced, the results being much appreciated. Details of this work are on file and would be good reading to any one interested in the varied angles of sludge-removal.

During the early part of last summer the Municipalities of Armstrong and Spallumcheen complained to the Board in regard to a very offensive odour arising from Otter Lake. The Water Rights Branch were also appealed to. Mr. F. W. Groves, C.E., and the writer made a joint survey of the lake and its sources. The nuisance or annoyance was found to be caused by decaying algæ known as *Hydrus fœtitus*, its presence causing a very offensive smell. The lake is shallow and sluggish. As a remedy it was suggested that the outlet of the lake be cleared to promote action and a small quantity of bluestone, 1 to 10,000 parts, be used in those portions of the lake where the growth of algæ is noticeable.

During last September a serious outbreak of typhoid occurred in a logging camp in the Crowsnest country; total number of cases, 20; fatal, 6. As soon as notified, this Department inspected the camp and at once condemned the site as insanitary. Repeated visits have been made by the Provincial police under instructions from the Provincial Board of Health to see that the camp is not used again under the old conditions. From investigation made it appears that one of the employees had suffered from typhoid fever in an adjoining State a year ago. The general conditions of the camp were insanitary, no fly-screens provided or any disinfecting precaution being thought of, manure allowed to accumulate, and everything was favourable for the propagation of the greatest typhoid-carrier, the fly. There were several sources of good water available, but the poorest was most convenient and that was the choice.

The question of the contamination of watersheds and sources of water-supply of the Cities of Vancouver and North Vancouver has assumed an immediate importance owing to the fact that timber limits lying in the watershed area are being worked and mines are to be developed. The enforcement of regulations for the protection of the water-supply will throw an increased responsibility on your staff.

In the fish- and food-canning supervision by this Department I regret to say that the recent expected big year was to many canners a disappointment. The sanitary conditions of these establishments on the lower part of the Mainland Coast have been satisfactory except in an isolated case.

The salmon-canneries located on the Nass and Skeena Rivers, Rivers Inlet, Smith Inlet, and Johnstone Strait were visited during the early summer per regular steamer. The general sanitary conditions were found to be good. A few requests were made where needed regarding

bunk-houses and conveniences. The regulations in reference to the disposal of fish-offal has not so far been rigidly enforced owing to the fact that the majority of them are isolated, and also the purchase of the necessary machinery to handle the offal is at this time impossible owing to war conditions. There are two responsible companies contemplating the erection of fish guano and oil plants to serve these northern canneries just as soon as conditions permit. In the meantime we are demanding that many of the existing offal-chutes be extended in order to prevent the accumulation of fish-offal upon the foreshore which may be exposed at very low tides. There have been many complaints of abominable odours caused by the careless disposal of offal at the northern canneries. There is no necessity for such, and we are endeavouring to see this annoyance abated without hardship to the canners or fishermen. Were it not for prevailing abnormal conditions in securing material and labour for such work, drastic action would be taken.

On the Lower Fraser River inspection visits were made to the following canneries: Scottish Canadian, Lighthouse Cannery, Gulf of Georgia, Steveston Cannery, Columbia Cod Storage, Imperial Cannery, Phoenix Cannery, Britannia Cannery, Gosse-Millard Cannery, Colonial Cannery, Richmond Cannery, Great West Cannery, Vancouver Cannery, also Nanaimo Cannery and Great Northern Cannery on Burrard Inlet. The strict enforcement of our regulations governing canneries and the hearty co-operation given by the cannerymen has brought about almost perfect methods in the handling of this important food staple, so much so as to elicit most favourable comments from tourists and experts visiting these canneries.

The automatic handling of the fish by machinery is gradually bringing about an ideal condition of sanitation as regards the preparation of the salmon for the market. The machines installed are most ingenious, almost human in their perfect work, cutting, washing, slicing, and filling into solderless sanitary cans under the closest scrutiny of skilled artisans.

Colouring or chemical artifices have never been introduced into the salmon-canneries of British Columbia. In the past season our work in this direction was curtailed to some extent owing to the launch acquired from the Forestry Department needing extensive repairs. Lack of labour and material necessary for such work was not readily available owing to existing war conditions. The difficulty is now being overcome, and through the agency of this long-needed equipment the Department will be in an improved position to cope with the increasing demands for sanitary supervision in cannery and other industrial camps and settlements scattered along the 5,000 mile coast-line of this Province.

During August complaints were heard in reference to the insanitary conditions existing at some of the fruit and vegetable canning and evaporating plants of the Okanagan Valley. In many instances I found the complaints justified. Toilet and lavatory arrangements provided for the employees were insanitary and inadequate. This was my first visit, and in justice to the managers it is only fair to say tht my inspection was welcomed, and nearly every one expressed a wish to carry out any official suggestions which would promote efficiency and improve the comfort of the employees. Most of these plants are located within municipal limits, but the local authorities are inclined to think the Provincial Board of Health should exercise a supervising control in so far as sanitary conditions are concerned where food products are prepared for Provincial and export consumption. I beg to suggest the formulating of suitable regulations governing these establishments similar to those used for the salmon-canneries, which have been found to work in a highly satisfactory manner.

Our files show inspection reports and correspondence on the following establishments: Graham Evaporating Co., Armstrong; Graham Evaporating Co., Vernon; Dominion Fruit Cannery, Vernon; Western Canning Co., Kelowna; B.C. Evaporating Co., Kelowna; Independent Fruit Cannery, Peachland; Western Canners Co., Ltd., Penticton.

The total number of employees approximate some 800; 20 per cent. women, 50 per cent. boys and girls, 10 per cent. white skilled mechanics, and 10 per cent. Oriental. The past fruit season has been very successful in the great Okanagan Valley for growers and canners alike. Several large canning and preserving plants are expected to be built to take care of the increased crop expected during the coming season.

During the early part of the past summer complaints were lodged with this Department regarding insanitary and inadequate conveniences and lack of drinking-water for employees at the Shand Works, on James Island. Several special visits were made, and it was found that the company had already recognized the needs and was taking practical steps to remedy the

grievance (since completed). This concern employs several hundred men and is gradually building up a model town. A very competent first-aid man is continually on the works and special facilities provided for quick medical attendance in case of accident.

Complaints have recently been lodged regarding water-pollution at several seaside summer resorts well patronized by Vancouver and New Westminster citizens. These places will have our attention before the coming season.

In reference to the requirement of provision of first-aid in industrial camps, I find that the smaller camps are the principal offenders in their neglect of such provision. There is a great improvement in this respect, however, since we have been able to avail ourselves of the services of the Provincial police as Sanitary Inspectors in the outlying districts. A complete list of the existing camps has been supplied by a careful canvass of the different police districts, and also through the courtesy of the Forestry Department, who supplied us with a list of the logging camps. Under the present system of reporting by the police we are able to keep in touch with all new camps and to give immediate attention to complaints.

The operators have shown a great willingness to carry out all suggestions offered, and the provisions of section 2 of "An Act for the Protection of Workmen engaged in Industrial Operations" are being observed to a much greater extent than formerly. The section referred to is as follows:—

"2. Every employer of labour directly or indirectly operating any mine, camp, construction-work, or industry employing more than thirty persons, and being situated more than six miles from the office of a medical practitioner, shall at all times maintain in or about such industry or works at least one person possessing a certificate of competency to render first aid to the injured, and shall also provide a good and sufficient ambulance box or boxes."

I would recommend that the above, in so far as requiring the provision of an ambulance-box, should apply to railway-trains and also to steamers on inland waters. The importance of antiseptic treatment of even slight wounds and of other first aid in cases of emergency is now generally recognized. Many thousands of dollars compensation, the Workmen's Compensation Board's statistics will show, might be saved by preventing blood-poisoning and other serious consequences by the proper use of "first-aid services."

In conclusion, permit me to remind you that the office files will show that the work of this branch of the Department has been carried on in a systematic manner and the varied conditions dealt with as presented, and I am pleased to be able to say that without exception most courteous treatment is accorded to our Inspectors wherever their duties call them.

I have, etc.,

FRANK DEGREY,

Chief Inspector.

HOSPITAL INSPECTION.

VICTORIA, B.C., February 1st, 1918.

H. E. Young, M.D.,

Secretary, Provincial Board of Health, Victoria, B.C.

SIR,—In submitting for your consideration the Fifth Annual Report on Hospital Inspection in British Columbia, I am pleased to say that no serious event has occurred in hospital circles here to mar the report of the capable management shown during the past year.

The following licensed private hospitals have been periodically inspected and any changes or improvements suggested have been carried out:—

Arnold Maternity Home (Matron, Mrs. M. Arnold), 316 Robson Street, Nelson, B.C.
Bent Sanatorium (Matron, Mrs. E. Bent), 245 Fenwick Avenue, Cranbrook, B.C.
Britannia Hospital (Superintendent, Dr. Burke), Britannia Beach, Howe Sound, B.C.
Bass Maternity Home (Matron, Mrs. M. C. Bass), 2625 Prior Street, Victoria, B.C.
Bute Hospital (Superintendent, Mrs. M. E. Johnson), Bute and Robson Streets, Vancouver, B.C.
Bell Nursing Home (Matron, Mrs. L. Bell), 756 Cloverdale Avenue, Victoria, B.C.
Convalescent Home (Matron, Miss E. O'Brien), 67 Wellington Avenue, Victoria, B.C.
Coquitlam Hospital (Superintendent, Dr. Sutherland), Port Coquitlam, B.C.

Corbman Maternity Home (Matron, Mrs. E. Corbman), 855 Eleventh Avenue East, Vancouver, B.C.
Down Maternity Home (Matron, Miss Rose Down), Battle Street West, Kamloops, B.C.
East Kootenay Hospital (Superintendent, Dr. Garner), Jaffray Street, Fernie, B.C.
Grandview Hospital (Superintendent, Dr. E. Hall), 1090 Victoria Drive, Vancouver, B.C.
Handley Maternity Home (Matron, Mrs. J. Handley), 1218 Queen's Avenue, Victoria, B.C.
Harbour View Sanatorium (Matron, Miss E. McLeash), 370 Second Avenue East, North Vancouver, B.C.
Impey Maternity Home (Matron, Mrs. M. A. Impey), 243 Eighth Avenue West, Vancouver, B.C.
Kitsilano Private Hospital (Superintendent, Miss Annie Scott), 2494 Third Avenue West, Vancouver, B.C.
Lonsdale Private Hospital (Matron, Mrs. M. D. Schultz), 1900 Lonsdale Avenue, North Vancouver, B.C.
Moore Nursing Home (Matron, Mrs. E. Moore), Baker and Falls Street, Nelson, B.C.
More Maternity Home (Matron, Mrs. C. More), 949 Fisgard Street, Victoria, B.C.
McGuffie Maternity Home (Matron, Mrs. M. A. McGuffie), 628 Columbia Street, Kamloops, B.C.
McKenzie Nursing Home (Matron, Mrs. F. McKenzie), 1781 Second Street, Victoria, B.C.
Rutherford Maternity Home (Matron, Mrs. E. Rutherford), 2321 Shakespeare Street, Victoria, B.C.
Roadley Nursing Home (Matron, Mrs. L. Roadley), 360 Battle Street, Kamloops, B.C.
Roycroft Private Hospital (Matron, Miss Roycroft), 1036 Haro Street, Vancouver, B.C.
Ross Convalescent Home (Matron, Miss E. G. Ross), 1145 Faithful Street, Victoria, B.C.
Salmon Maternity Home (Matron, Mrs. A. Salmon), Garden Avenue, Cranbrook, B.C.
South Vancouver Private Hospital (Superintendent, Mrs. Jane Webb), 1298 Fifty-first Avenue, South Vancouver, B.C.
Skelland Nursing Home (Matron, Mrs. E. Skelland), 2316 Lee Avenue, Victoria, B.C.
St. Luke's Home (Superintendent, Sister Francis), 309 Cordova Street, Vancouver, B.C.
Sunnyview Sanatorium (Superintendent, Dr. Irving), Powers Addition, Kamloops, B.C.
Tomley Maternity Home (Matron, Miss L. Tomley), 129 Twenty-second Avenue West, South Vancouver, B.C.
Victoria Private Hospital (Superintendent, Miss J. B. Archibald), 1116 Rockland Avenue, Victoria, B.C.
West End Hospital (Superintendent, Miss H. G. Tolmie), 1447 Barclay Street, Vancouver, B.C.
Witt Maternity Home (Matron, Mrs. A. C. Witt), 1845 Forty-sixth Avenue East, South Vancouver, B.C.
Winters Nursing Home (Matron, Mrs. M. Winters), 1020 Harwood Street, Vancouver, B.C.

Improved means of fire-escape and protection for every hospital and safer repositories for medicines or drugs have been persistently advocated with gratifying results. One sanatorium (Neal Institute) has closed its doors through lack of patients, and one convalescent home has closed for the same reason. Four private maternity hospitals have voluntarily closed through those in charge having tendered their services for hospital-work overseas. Three new licences have been granted and a number of applications considered, but not granted owing to lack of necessary qualifications on the part of the applicant or to the premises not being suitable. One licence has been temporarily suspended. A number of illegal so-called maternity or lying-in homes have been suppressed in various parts of the Province, demonstrating the necessity of constant vigilance in carrying out the provisions of the "Hospital Act Amendment Act."

The large public institutions, being under control of a Governing Board, with two of the members representing the Government, are not subject to the same inspection visits except for specific reason. A cordial co-operation exisits, however, and much valuable information furnished for the purpose of tracing infection sources in the outlying districts.

The following Government-aided charitable and public institutions were visited:—

St. Paul's Hospital, Vancouver, B.C.
Alexander Orphanage, Vancouver, B.C.

Children's Aid Society, Vancouver, B.C.
Monastery of Our Lady of Charity, Vancouver, B.C.
Salvation Army Maternity Home, Vancouver, B.C.
Providence Orphanage, New Westminster, B.C.
St. Mary's Hospital, New Westminster, B.C.
Orange Orphans' Home, New Westminster, B.C.
Quamichan Boys' Protectorate, Quamichan, V.I., B.C.
St. Ann's Orphanage and School, Nanaimo, B.C.
St. Joseph's Hospital, Victoria, B.C.

The existing war-time conditions have brought to these institutions increased burdens without a corresponding increase in income. Indeed, it is a marvel how exceedingly well these homes are managed in the face of such depressing conditions which they have to meet, especially in view of the extra calls upon the societies who volunteer their services in assisting such charities.

I have, etc.,
FRANK DEGREY,
Chief Inspector.

MEDICAL INSPECTION OF SCHOOLS.

VICTORIA, March 22nd, 1918.

Hon. J. D. MacLean,
Provincial Secretary, Victoria, B.C.

SIR,—I beg leave to submit the Report of the Medical Inspection of Schools which has taken place during the past six months. There has been a break in the continuity of the work of the Department. In 1916 the matter was up before yourself as to the continuance of the inspection of schools, and it was decided at the time not to proceed for the time being, pending investigation. In 1917, however, I was instructed to begin the inspection again, and the consequence is that the report submitted is only for the latter part of the year 1917. The practice heretofore had been for the examination to be made once during the scholastic year, and while the appointments of the medical men were made in September it was not possible, owing to the lateness of the season, in many of the outlying districts to have the inspection made. The consequence is that only one-half of the schools have been reported, and the other half will be inspected during the spring term. These reports will not be received until the midsummer. But when these reports are received it will enable us to make a full report for the year September, 1917, to September, 1918, by embodying the reports already received with those which will be received within the next few months.

I have, in my Report for the Board of Health, suggested to you the advisability of having the annual report of this Department issue at midsummer on account of the difficulty of receiving the returns at the beginning of the year in time for presentation in the House. Should this suggestion be adopted it would not only benefit us in our report of the Vital Statistics Office, but especially so in our report on schools.

I would beg leave to suggest that the Inspection of Schools Branch of the Department be continued and a further effort be made to interest local associations in the work.

It is the intention in Great Britain and in the United States to concert the attention of all departments upon child-welfare and to reduce infant mortality, and this Department hopes that by co-operating with the central portions of this country that we may take our part in this nation-wide movement. To accomplish results, however, it will be absolutely necessary that all local organizations, more especially Women's Institutes, will lend their efforts to the furthering of the movement. It is the intention of the Department to make an especial appeal to the medical men who are doing the work to endeavour to appreciate its importance, to advise with the Department, and more particularly to work in conjunction with the parents in an endeavour to render effective an educational campaign.

I would also suggest for your consideration a recommendation to the School Boards of the establishment of open-air school-rooms for weakly and pre-tubercular children. The work already done along these lines has been so satisfactory that I feel justified in urging the adoption of similar methods in British Columbia.

I beg leave to submit a detailed report of the work done by the Department, and also copy of a report from the Inspectors of the different schools.

I have, etc.,

H. E. YOUNG,

Secretary, Provincial Board of Health.

SCHOOLS INSPECTED.

RURAL AND ASSISTED SCHOOLS.

Schools inspected: 1916, 331, at a cost of $5,653.82; 1917, 129, at a cost of $2,112.75.

Schools not inspected: 1916, 117; 1917, 367.

Pupils inspected: 1916, 7,945; 1917, 3,518, a decrease of 4,427.

Cost of inspection per pupil: 1916, 71⅙ cents; 1917, 60½ cents.

Percentage of defects: 1916, 78.50; 1917, 75.64, less 2.86.

Medical Inspectors: 1916, 28 Medical Inspectors; 1917, 82 Medical Inspectors.

Medical Inspectors: 1916, 89 reports from the Medical Inspectors; 1917, 35 reports from the Medical Inspectors.

GRADED CITY SCHOOLS.

Cities, 35. 1916: Reported, 27; not reported, 6. 1917: Reported, 14; not reported, 21.

Pupils inspected: 1916, 25,254; 1917, 22,564, a decrease of 1,690.

HIGH SCHOOLS.

High schools, 38. 1916: Reported, 19; increase of 181 pupils inspected. 1917: Reported, 16; increase of 54 pupils inspected.

RURAL MUNICIPAL SCHOOLS.

Municipalities: 1916, 28; reported, 22; not reported, 6. 1917, 27; reported, 12; not reported, 15.

Pupils inspected: 1916, 10,469, a decrease of 1,093; 1917, 9,012, a decrease of 1,457.

HIGH

Name of School.	Medical Inspector.	School Nurse.	No. of Pupils enrolled.	No. of Pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Armstrong	No report 1917.										
Chilliwack	J. C. Henderson		102	99	1	....	2	....	....	....	5
Cumberland	No report 1917.										
Duncan	"										
Enderby	"										
Fernie	"										
Grand Forks	W. Truax		62	58	....	....	2	....	....	....	2
Kamloops	M. G. Archibald		52	52	....	....	....	....	....	1	2
Kaslo	No report 1917.										
Kelowna	W. J. Knox		.....	.....	....	....	1	1	....	....	3
Ladner	A. A. King		.....	30	2	....	4	....	....	3	7
Ladysmith	No report 1917.										
Matsqui	R. H. Post		79	74	3	....	1	....	....	1	3
Nanaimo	W. F. Drysdale		91	91	....	....	4	....	....	....	6
Nelson	Isabel Arthur		160	120	....	....	14	3	....	1	5
New Westminster	E. H. McEwen		327	296	8	....	....	1	....	7	16
Peachland	No report 1917.										
Point Grey	A. Lowrie		110	110	2	....	12	4	4	1	6
Prince Rupert	J. C. Cade		30	28	....	....	1	....	....	....	4
Rossland	J. W. Coffin		50	50	....	....	1	....	....	....	....
Revelstoke	J. H. Hamilton		56	56	....	....	8	....	....	3	15
Salmon Arm	No report 1917.										
Summerland			26	22	....	....	1	....	....	....	3
Vancouver:											
Boys	F. W. Brydone-Jack		.....	.....	....	....	....	....	....	....	....
Girls	Belle H. Wilson		.....	.....	....	....	....	....	....	....	....
Britannia	"		387	203	1	....	22	8	4	....	13
King Edward	"		750	223	....	....	16	12	1	....	13
King George	F. W. Brydone-Jack / Mrs. M. P. Hogg		297	170	6	....	8	3	4	....	3
Vancouver, North	Pupils not examined.										
Vancouver, South	L. O. Griffin	H. Bone	290	287	....	....	14	10	2	2	21
Victoria	No report 1917.										

GRADED CITY

Grand Forks	W. Truax		370	358	....	2	18	2	8	10	29
Kamloops	M. G. Archibald		425	375	....	....	6	....	17	38	67
Kelowna	W. J. Knox		.....	.....	4	2	17	5	7	5	17
Merritt	G. H. Tuthill		233	222	3	....	13	1	8	21	59
Nanaimo:											
South Ward	W. F. Drysdale		120	112	....	....	2	1	....	7	20
Middle Ward	"		156	152	1	....	8	....	....	15	27
Central	"		416	407	6	....	14	....	....	71	119
Quennell	"		297	289	4	....	20	....	....	62	106
Nelson	Isabel Arthur		725	679	5	2	24	5	20	21	74
New Westminster:											
John Robson	E. H. McEwen		327	*296	8	....	1	1	....	7	16
F. W. Howay	"		391	355	24	....	....	1	....	16	43
Herbert Spencer	"		316	268	22	....	....	....	....	16	54

SCHOOLS.

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions, specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
4	1	24	.....	....	....	....	....	.....	Good.....	Yes.
								.....		
								.....		
								.....		
2	....	2	.....	....	....	....	....	Smallpox, 23.....	Very poorly ventilated and badly heated; entirely inadequate to the number of pupils	Fairly clean but inadequate for the pupils.
6	....	15	Anæmia, 1.....	....	....	....	....	.....	Well ventilated and heated	Yes.
3	....	5	Chronic bronchial catarrh, 2....	....	....	....	....	.....	Good.....	"
6	10	....	.....	....	....	....	....	.....	Wood and cement.	Flush closets.
7	....	1	Anæmia.....	....	....	12	....	Whooping-cough, 15.....	Good.....	Yes.
28	....	7	.....	....	....	....	....	Measles, 1.....	Fair.....	Good.
35	....	30	Cardiac, 2; acne, 1.....	....	....	....	....	.....	All in good condition	Yes.
90	21	....	.....	39	....	47	44	Chicken-pox, 25; scarlet fever 1; mumps, 46	Good.....	Good.
31	1	23	Cardiac, 1; nervous, 1.....	1	....	....	....	.....	Ventilation improved	Yes.
2	1	1	Boils, 3.....	....	....	....	....	.....	Adequate in all respects	"
....	....	1	Good.....	....	....	....	....	.....	Satisfactory.....	"
4	11	....	.....	....	....	....	....	.....	Good.....	Good.
4	2	2	Orthopædic, 1.....	....	....	....	....	.....	Fairly good. Ample room	2 cement pit, clean.
....	....	....	.....	....	....	....	....	.....	.....	
....	....	....	.....	....	....	....	....	.....	.....	
82	....	24	Cardiac, 8; lungs, 1.....	....	....	....	....	.....	.....	
84	1	21	Cardiac, 7.....	....	....	....	....	.....	.....	
42	4	15	Cardiac, 10.....	....	....	....	....	.....	.....	
65	4	17	Cardiac, 6; anæmia, 4.....	....	....	....	....	Chicken-pox, 1; diphtheria, 1	Good.....	Good.

SCHOOLS.

68	10	40	Cardiac, 2.....	....	....	3	....	Smallpox, 1	Good.....	Yes.
192	....	29	Anæmia, 1; nasal polypi.....	....	....	....	....	.....	Ample air-space; well ventilated and heated	Clean as plans and construction of building allow
21	2	36	Chronic Bronchial catarrh, 7; cardiac, 4	....	....	8	3	.....	Excellent, modern	Yes.
120	67	28	Cardiac lesions, 2	1	1	...	1	Chicken-pox, 35; whooping-cough, 2; measles, 86	Satisfactory	Good in 1-6 div. Poor in 7-8 "
58	....	....	.....	....	....	....	3	Diphtheria, 3; chicken-pox, 4	Fair	Good.
84	....	....	.....	1	....	....	....	Diphtheria, 1; chicken-pox, 1	"	"
215	3	9	Heart, 1; eczema, 3	1	....	....	2	Measles, 1; chicken-pox, 17; pertussis, 9	Very fair.....	"
138	4	9	Eczema, 2.....	....	....	....	....	Chicken-pox, 3; pertussis, 4	Good.....	"
414	7	150	Heart murmur, 7; infantile paralysis, 1; talipes, 2; chorea, 1	3	....	....	5	Chicken-pox, 24; scarlet fever, 1	"	Yes.
90	21	....	.....	39	....	47	44	Chicken-pox, 25; scarlet fever, 1; mumps, 46	"	"
92	31	....	.....	....	....	....	....	.....	"	"
71	31	....	.....	....	....	....	....	.....	"	"

GRADED CITY

Name of School.	Medical Inspector.	School Nurse.	No. of Pupils enrolled.	No. of Pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
New Westminster.--*Concluded:*											
Richard McBride	E. H. McEwen		348	306	38	....	50	....	...	15	59
Lord Lester	"		261	203	9	....	....	....	....	1	11
Lord Kelvin	"		315	328	21	....	....	..	...	38	57
Queensboro	"		86	72	1	...	....	....	....	3	8
Prince Rupert:											
Borden Street	J. C. Cade (acting)		158	149	2	....	9	1	1	1	30
King Edward	" "		292	271	3	1	15	....	3	6	49
Seal Cove	"		27	26	1	...	....	....	....	...	4
Revelstoke:											
Central	J. H. Hamilton		288	268	....	..	21	....	...	43	70
Selkirk	"		349	327	....	....	21	....	....	19	39
Rossland:											
Central	J. W. Coffin		390	390	2	1	3	2	2	6	8
Cook Ave	"		216	216	1	...	1	1	1	2	4
Sandon	W. E. Gomm		42	30	...	....	3	....	2	2	13
Vancouver:											
Aberdeen	F. W. Brydone-Jack. B. H. Wilson	M. A. McLellan.	334	285	5	2	19	6	14	5	52
Alexandra	F. W. Brydone-Jack. B. H. Wilson	A. Jeffers	526	458	5	...	29	14	19	1	41
Bayview	F. W. Brydone-Jack. M. P. Hogg	M. A. McLellan.	242	230	1	....	12	4	4	30	26
Beaconfield	F. W. Brydone-Jack. M. P. Hogg	A. Jeffers M. Cruickshanks	176	188	11	1	12	7	3	4	32
Cecil Rhodes	F. W. Brydone-Jack. M. P. Hogg	M. Ewart	344	355	1	....	22	11	13	6	42
Central	F. W. Brydone-Jack. B. H. Wilson	E. G. Breeze	509	433	7	....	25	10	11	6	59
Charles Dickens	F. W. Brydone-Jack. B. H. Wilson	M. Ewart M. Cruickshanks	274	268	2	1	14	6	6	4	20
Children's Aid	F. W. Brydone-Jack. B. H. Wilson	A. Jeffers. E. G. Breeze	122	176	9	...	7	5	6	2	12
Dawson	F. W. Brydone-Jack. B. H. Wilson	M. A. McLellan.	831	726	4	....	38	18	27	7	67
Fairview	F. W. Brydone-Jack. M. P. Hogg	M. A. McLellan. M. Ewart	593	479	1	1	22	13	31	4	60
Florence Nightingale	F. W. Brydone-Jack. B. H. Wilson	M. Ewart A. Jeffers	629	530	8	....	35	16	19	1	55
Franklin	F. W. Brydone-Jack. M. P. Hogg	A. Jeffers M. Cruickshanks	168	192	9	....	8	5	9	2	33
General Gordon	F. W. Brydone-Jack. M. P. Hogg	M. A. McLellan.	347	283	3	....	23	9	7	6	42
Grandview	F. W. Brydone-Jack. M. P. Hogg	A. Jeffers	467	478	5	....	16	5	16	2	45
Hastings	F. W. Brydone-Jack. B. H. Wilson	A. Jeffers M. Cruickshanks	420	460	12	1	17	14	6	1	25
Henry Hudson	F. W. Brydone-Jack. M. P. Hogg	M. A. McLellan. M. Ewart.	458	375	7	1	24	9	18	8	67
Kitsilano	F. W. Brydone-Jack. M. P. Hogg	M. A. McLellan.	409	349	5	1	20	12	9	7	61
Laura Secord	F. W. Brydone-Jack. B. H. Wilson	A. Jeffers M. Cruickshanks	308	288	5	1	6	7	6	3	10
Livingstone	F. W. Brydone-Jack. B. H. Wilson	M. Ewart M. Cruickshanks	328	302	2	....	15	4	12	2	17
Macdonald	F. W. Brydone-Jack. B. H. Wilson.	A. Jeffers M. Cruickshanks	362	329	8		15	10	11	2	26
Model	F. W. Brydone-Jack. B. H. Wilson	M. Ewart	497	464	2	....	42	8	20	5	68
Mount Pleasant	F. W. Brydone-Jack. B. H. Wilson	M. Ewart A. Jeffers	639	505	4	...	31	11	29	3	40
Nelson	F. W. Brydone-Jack. B. H. Wilson	A. Jeffers	602	537	12	....	43	9	9	1	45
Roberts	F. W. Brydone-Jack. B. H. Wilson.	E. G. Breeze M. A. McLellan.	837	741	6	1	48	13	16	5	54
Seymour	F. W. Brydone-Jack. B. H. Wilson	E. G. Breeze	489	479	7	....	25	12	16	9	91
Simon Fraser	F. W. Brydone-Jack. B. H. Wilson.	M. Ewart	494	463	3	....	30	8	26	2	58
Strathcona	F. W. Brydone-Jack. B. H Wilson	E. G. Breeze	633	644	2	....	30	13	23	9	88

SCHOOLS.—*Continued.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions, specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
84	31	....	.....	....	....	....	....	.....	Good.....	Yes.
91	15	....	.....	....	....	....	....	.....	"	"
87	55	....	.....	....	....	....	....	.....	"	"
21	13	....	.....	....	....	....	....	.....	"	"
48	20	...	Nervous, 2; pulmonary, 2; cardiac, 1; anæmia, 1; otitis media, 1	3	....	5	1	Scarlet-fever, 1; chicken-pox, 1; tonsilitis, 1; T. B. spine, 1	Adequate, fairly heated and ventilated	"
62	20	....	Nervous, 2; pulmonary, 2; Brights, 1	7	1	2	....	Tonsilitis, 1; chicken-pox, 6; measles, 2; influenza, 1	Adequate, well-heated and ventilated	"
6	2	....	Nervous, 1; anæmia, 1	....	....	1	....	Chicken-pox, 2.....	Adequate, well-heated and ventilated	"
56	23	....	Absence left palate, 1....	....	....	....	....	.....	Good.	Good.
38	10	....	Cleft palate, 1; osteo-myelitis, 1; myocarditis, 1	....	....	1	....	.....	"	"
14	13	2	Cardiac, 2.....	....	....	2	....	Whooping-cough.....	Satisfactory	Yes.
8	11	1	Cardiac, 2.....	....	....	....	....	Whooping-cough.....	"	"
1	1	3	.....	....	....	....	....	.....	Good.....	"
86	7	5	Vaccinated, 72; cardiac, 5; lung, 2	....	....	....	....			
172	3	15	Vaccinated, 66; cardiac, 4; lung, 1	....	....	....	....			
38	12	14	Vaccinated, 25; cardiac, 7	....	....	....	....			
53	15	7	Vaccinated, 30; cardiac, 6; lung, 1	....	....	3	1			
85	2	11	Vaccinated, 63; cardiac, 7; lung, 2	....	....	....	...			
121	4	16	Vaccinated, 115; cardiac, 8; lung, 1	2	....	1	....			
73	15	8	Vaccinated, 29; cardiac, 2; lung, 1	1	1	2	....			
50	5	0	Vaccinated, 14; cardiac, 7.....	....	10	5	....			
189	31	33	Vaccinated, 168; cardiac, 19; ung, 12	....	1	....	....			
112	28	21	Vaccinated, 94; cardiac, 10; lung, 6	3	....	....	1			
169	9	23	Vaccinated, 72; cardiac, 9; lung, 2	....	3	4	....			
49	10	12	Vaccinated, 56; cardiac, 2; lung, 2	....	....	....	1	Communicable diseases in children of school age in Vancouver City:—		
46	19	13	Vaccinated, 75; cardiac, 4; lung, 4	1	....	....	....			
140	3	14	Vaccinated, 53; cardiac, 7; lung, 2	....	....	1	....	Chicken-pox 287		
151	11	21	Vaccinated, 45; cardiac, 8	2	....	2	1	Diphtheria..... 21	Good	Yes.
92	24	27	Vaccinated, 63; cardiac, 7; lung, 3	2	1	4	....	Measles ..... 67 Mumps 493		
52	21	13	Vaccinated, 53; cardiac, 6; lung, 12	2	....	....	....	Scarlet fever.... 32 Whooping-cough 51		
81	4	8	Vaccinated, 40; cardiac, 1	3	1	1	....	Infantile paralysis 3		
110	7	8	Vaccinated, 66; cardiac, 5; lung, 1	1	1	1	....			
124	3	8	Vaccinated, 50; cardiac, 3 ....,	....	....	....	....			
118	22	16	Vaccinated, 66; cardiac, 13; lung, 1	1	....	1	....			
148	5	13	Vaccinated, 44; cardiac, 5	1	3	....	....			
180	3	22	Vaccinated, 49; cardiac, 8; lung, 1	....	1	2	1			
188	20	21	Vaccinated, 193; cardiac, 13; lung, 1	1	1	....	....			
121	16	13	Vaccinated, 84; cardiac, 13; lung, 9	4	....	2	....			
157	20	20	Vaccinated, 41; cardiac, 11; lung, 8	2	1	2	....			
202	22	21	Vaccinated, 135; cardiac, 8; lung, 5	11	1	3	....			

GRADED CITY

Name of School.	Medical Inspector.	School Nurse.	No. of Pupils enrolled.	No. of Pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Vancouver.—*Concluded:*											
Tennyson	F. W. Brydone-Jack / M. P. Hogg	M. A. McLellan. / M. Ewart	524	397	8	....	18	13	17	2	60
Classes for Defects	B. H. Wilson / M. P. Hogg	A. Jeffers / E. G. Breeze	43	35	...	21	11	8	1	....	1
Vancouver, North:											
Lonsdale	E. A. Martin		213	210	3	....	8	....	13	13	44
Queen Mary	"		341	336	2	....	10	1	7	7	56
Ridgway	"		343	340	3	1	6	2	6	6	63

RURAL MUNICIPALITY

Burnaby:											
Edmond Street	Geo. de B. Watson		267	267	....	....	7	5	1	2	30
Douglas Road	"		32	32	....	....	1	....	....	....	2
Hamilton Street	"		29	24	....	....	....	....	....	....	1
Kingsway, East	"		70	70	....	....	8	1	....	1	7
Second Street	"		39	39	....	....	1	2	....	....	5
Armstrong Avenue	"		33	33	....	....	....	....	....	....	4
Chilliwack:											
Rosedale	J. C. Elliott		90	84	2	1	3	5	8	4	7
Chilliwack, East	"		44	41	1	....	2	3	2	5	6
Camp Slough	"		35	36	2	1	1	3	5	2	4
Cheam	"		58	59	2	1	2	5	3	5	8
Strathcona	J. C. Henderson		43	41	....	....	....	....	....	4	5
Fairfield Island	"		41	39	....	....	....	....	....	4	10
Vedder	"		15	14	1	....	1	....	....	1	2
Yarrow	"		8	6	....	....	....	....	....	....	....
Promontory	"		11	15	....	....	1	....	...	1	1
Sumas	"		10	8	....	....	1	....	....	1	2
Atchelitz	"		66	57	....	...	2	....	1	3	8
Parson's Hill	"		9	9	....	1	....	....	....	1	1
Lotbiniere	"		64	60	1	....	1	....	1	8	10
Sardis	"		115	103	....	1	2	1	2	7	9
Delta:											
Annieville	A. A. King		55	38	1	....	1	....	....	7	6
Delta, East	"		20	16	....	....	2	....	....	2	5
Inverholme	"		12	11	....	....	....	....	....	4	5
Boundary Bay	"		23	20	6	....	2	....	....	6	2
Westham	"		20	19	....	....	4	1	....	6	6
Canoe Pass	"		39	33	6	....	4	2	....	9	9
Trenant	"		26	24	....	....	2	....	....	4	8
Sunbury	"		18	16	1	....	1	....	....	5	4
Ladner	"		.....	122	7	....	14	5	....	27	30
Langley:											
Langley Fort	A. McBurney		63	51	1	2	3	....	....	....	8
Langley Prairie	"		75	61	....	....	2	....	2	4	14
Springbrook	"		39	22	....	....	1	2	2	....	7
Belmont, Superior	"		86	72	6	2	7	4	3	1	14
Milner	"		47	44	....	....	....	....	2	....	8
Glen Valley	"		22	20	....	....	....	....	....	....	5
Langley, West	"		16	14	....	2	....	....	....	....	3
Beaver	"		30	26	..	....	1	....	....	....	5
Aldergrove	"		55	52	...	2	1	1	4	....	15
Patricia	"		23	21	1	....	2	....	....	....	5
Otter	"		19	16	....	....	2	....	....	....	3
Lochiel	"		12	12	....	..	1	....	....	....	2
Langley, East	"		24	21	....	1	3	....	1	1	5
Glenwood	"		16	16	....	....	2	....	1	....	2
Maple Ridge:											
Whonnock	G. Morse		54	47	1	.. .	6	1	...	....	9
Ruskin	"		34	27	....	....	2	....	....	....	3
Alex. Robinson	"		43	37	....	....	1	1	....	1	8
	"										
Albion	"		37	18	....	....	....	....	....	....	3
Webster's Corners	"		19	17	....	1	2	2	....	....	5

SCHOOLS.—*Concluded.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions, specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
95	20	8	Vaccinated, 64; cardiac, 8; lung, 6	....	....	....	1			
14	2	2	Vaccinated, 5	....	....	....	....			
72	1	....		....	....	2	1	Measles and chicken-pox	Good	Yes
80	1	....	Cardiac, 3	....	....	....	..	Measles and chicken-pox	"	"
76	4	2	Cardiac, 2	4	....	1	....	Measles and chicken-pox	"	"

SCHOOLS.

116	37	....	Eczema, 1; uncleanliness, 7; bronchitis, 2; heart-trouble, 5; wax in ears, 4; rhinitis, 1; thickened nasal septum, 3	....	....	2	2	Chicken-pox, 40; measles, 3; mumps, 1; diphtheria, 2	Good	Yes.
12	7	....	Rhinitis, 1	....	....	....	....		"	"
8	4	....	Uncleanliness, 1	....	....	....	....		"	"
20	4	....	Uncleanliness, 1; pulmonary, 1; tuberculosis, 1; wax in ears, 1; rhinitis 1	....	....	....	....	Chicken-pox, 17	"	"
19	8	....	Tonsilitis, 3; rhinitis, 3	....	....	....	....	Chicken-pox, 1	"	"
9	2	....		....	....	....	....	Scarlet fever; mumps, 1	"	"
53	2	7		....	....	3	....		"	Fair.
29	1	3	Anæmia, 3	....	4	4	....		Fair	Good.
18	....	3	Anæmia, 2	....	....	....	....		Good	"
34	....	4	Anæmia, 2; heart lesions, 2	....	....	5	....		"	"
6	....	4		....	....	....	....		"	Yes.
10	....	3		....	....	....	....		"	"
3	....	1		....	....	....	....		"	"
3	....	1		....	....	....	....		"	"
3	....	1		....	....	....	....		"	"
....	....	....	Cardiac, 1	....	....	....	....		"	"
9	....	5		....	....	....	....		"	"
....	....	1		....	....	....	....		"	"
21	....	10	Cardiac, 1	....	....	....	....		"	"
12	....	10		....	....	....	....		"	"
9	2	....		....	2	3	....	Diphtheria, 1	"	"
2	....	....		....	....	....	....		"	"
5	1	....		....	....	....	....		"	"
5	2	....		....	....	....	....	Scarlet fever, 2	"	"
13	1	....		....	....	4	....		"	"
14	....	....		....	....	....	....		"	"
4	....	....		....	....	....	....	Mumps, 2	"	"
9	....	....		....	....	3	....		"	"
50	8	....		....	5	10	....	Scarlet fever, 1	"	"
18	1	1		....	....	....	....		....	
22	2	1	Cardiac, 1; cleft palate, 1	....	....	....	....	Chicken-pox, 27	Good	Yes.
12	1	....		....	....	....	....	Chicken-pox, 10; whooping-cough, 2	"	Clean.
24	2	1	Chronic bronchitis, 1	2	3	....	....	Chicken-pox, 15	"	Yes.
10	1	....		....	....	....	....		"	"
8	2	....	Chorea	....	....	....	....	Measles	Fair	"
6	....	....		....	....	....	....		Good	"
5	....	....		2	1	....	2		Crowded	Not clean.
15	....	1	Lame from infantile paralysis, 1	....	2	....	....	Measles and chicken-pox	Good	Yes.
2	....	....		....	....	....	....		"	Good.
6	....	....	Myocarditis, 1	....	....	....	....	Measles	"	Yes.
5	....	....		....	4	....	....		"	"
7	....	....	Cretin, 1	....	....	....	....		"	"
4	....	1		....	....	....	....		Bad	No.
28	7	1		3	....	....	....		Good	Yes.
9	2	....		....	....	....	....		"	"
23	7	....		....	....	....	....	Whooping-cough, 5; mumps, 1	"	"
10	3	....		....	....	....	....	Mumps, 1; chicken-pox, 2	"	"
13	3	....		....	....	....	....		"	"

RURAL MUNICIPALITY

Name of School.	Medical Inspector.	School Nurse.	No. of pupils enrolled.	No. of pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Maple Ridge.—*Concluded:*											
Haney	G. Morse		64	54	....	3	2	2	5	2	5
Yennadon	"		17	15	....	....	1	....	1	....	4
Haney, Superior	"		27	17	....	....	2	....	....	....	1
Maple Ridge, Senior	"		25	25	....	....	2	....	....	....	....
Maple Ridge, Junior	"		61	57	1	2	1	3	....	1	3
Hammond	"		54	52	....	....	3	....	1	2	2
Matsqui:											
Aberdeen	R. H. Port		32	29	2	....	2	....	1	2	5
Bradner	"		61	57	1	....	1	....	....	....	6
Clayburn	"		57	52	....	....	....	....	....	1	3
Dunach	"		17	12	....	....	1	....	....	....	....
Glenmore	"		23	13	1	....	1	....	1	1	....
Jubilee	"		7	7	1	....	....	....	....	1	....
Mount Lehman	"		46	38	1	....	1	1	....	....	5
Peardonville	"		27	24	....	....	1	....	....	1	2
Poplar	"		19	11	....	....	....	....	....	....	....
Ridgedale	"		45	38	....	....	3	1	....	1	2
Oak Bay:											
Monterey	F. T. Stainer		278	245	6	2	5	4	6	6	69
Willows	"		147	139	6	2	3	4	7	7	42
Pitt Meadows:											
Pitt Meadows	G. Morse		40	31	....	....	....	1	3	3	4
Richardson	"		16	12	....	....	....	....	2	....	5
Point Grey:											
Eburne	Andrew Lowrie		248	243	22	12	27	5	9	7	20
Magee	"		122	120	5	4	9	5	7	6	9
Lord Kitchener	"		97	96	7	3	10	4	4	5	20
Shaughnessy	"		224	221	16	11	29	11	14	11	21
Queen Mary	"		157	154	11	4	14	7	10	7	21
Kerrisdale	"		187	181	14	6	10	3	13	13	22
Saanich:											
Keating	C. D. Holmes		52	45	3	2	1	....	2	2	3
Mackenzie Avenue	"		119	80	6	4	3	2	5	5	8
Royal Oak	"		38	34	4	2	1	1	2	2	4
North Dairy	"		75	68	6	1	5	....	2	3	6
Craigflower	"		123	97	4	3	2	3	4	5	9
Cedar Hill	"		72	68	4	1	3	2	3	3	8
Cadboro Bay	"		14	7	....	....	....	....	....	1	1
Tillicum Road	"		26	23	2	2	1	....	3	4	5
Saanichton	"		33	24	3	....	2	....	....	....	2
Prospect	"		17	16	1	....	....	....	1	....	4
Saanich, West	"		55	49	2	1	....	....	....	1	3
Gordon Head	"		37	30	3	....	2	....	....	2	2
Strawberry Vale	"		57	43	....	....	....	....	1	2	7
Tolmie	"		394	343	40	19	7	5	12	15	33
Vancouver, North:											
Lynn Valley	E. A. Martin		167	167	3	3	13	....	3	5	29
Keith Lynn	"		34	34	....	....	....	....	1	1	1
Capilano	"		35	35	....	....	1	....	1	1	5
North Star	"		85	85	....	....	3	....	4	4	11
Vancouver, South:											
Lord Selkirk	L. O. Griffin	H. Bone	591	525	9	....	24	25	28	2	104
Tecumseh	"	"	460	458	6	1	14	11	19	2	67
Carleton	"	"	456	439	2	....	18	9	15	3	88

SCHOOLS.—*Continued.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions specify, (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
33	3	....	.....	....	....	....	....	Diphtheria, 2; mumps, 15	Good	Yes.
9	....	....	.....	....	....	....	....	.....	"	"
8	1	....	.....	....	....	....	....	.....	"	"
8	....	....	Cardiac, 1.....	....	....	....	....	.....	"	"
12	4	....	.....	....	....	....	....	Diphtheria, 2; mumps, 2; whooping-cough, 7	"	"
14	3	....	.....	....	....	....	....	Whooping-cough, 6.....	"	"
4	....	1	.....	3	....	....	....	.....	"	Not clean.
9	...	1	Bronchitis, 1; rhumatism, 1....	....	....	....	....	.....	"	Yes.
3	....	2	Tubercular bone, 1; bronchitis, 1	....	...	2	1	.....	Fair.....	"
2	....	....	Paralysis right hand, 1.....	....	....	....	....	.....	Good.....	"
3	....	1	.....	....	....	....	1	Whooping-cough, 10 ...	"	"
1	....	....	.....	....	....	....	....	.....	Fair.....	"
4	....	3	.....	....	....	....	....	.....	Good	"
2	....	1	.....	....	....	....	....	.....	"	"
....	....	....	.....	....	....	3	....	.....	"	"
7	...	....	.....	....	....	....	....	.....	"	"
135	24	....	Anæmia, 1	1	....	1	....	Measles, 73	"	Good.
73	11	....	.....	4	....	2	3	Measles, 41.....	Fair.....	"
14	....	....	.....	....	....	....	....	Whooping-cough, 10; chicken-pox, 1	Good.....	Yes.
8	....	....	.....	....	....	....	....	.....	"	"
79	15	29	Nervous, 1; cardiac, 4; pulmonary, 1; orthopædic, 1; skin, 1	9	....	....	....	Chicken-pox, 6; scarlet-fever, 2	"	"
16	4	17	Cardiac, 3; nervous, 1; pulmonary, 1; skin, 1; nephritis, 1	....	....	....	4	Scarlet fever, 4; measles, 3; chicken-pox, 1; influenza, 3	Excellent, ventilation improved	"
36	12	19	Nervous, 1; cardiac, 3; skin, 1; orthopædic, 1	2	....	....	....	Scarlet fever, 2; tuberculosis, 1; measles, 9, typhoid 1; mumps, 3	Overcrowded in Div. II.	"
44	11	33	Nervous, 3; cardiac, 4; pulmonary, 2; orthopædic, 4	4	....	....	....	Scarlet fever, 1; mumps, 24; chicken-pox, 2	Small building overcrowded	"
34	12	21	Nervous, 1; cardiac, 2; skin, 1; pulmonary, 2; orthopædic, 4	....	....	....	....	Chicken-pox, 25; measles, 2; scarlet fever, 1	Excellent	"
49	8	32	Cardiac, 6; pulmonary, 2; orthopædic, 1; skin, 2	2	....	....	2	Chicken-pox, 23; scarlet fever, 25; measles, 6	Good except Div. III. overcrowded	"
18	2	2	Acne, 1; eczema, 1.....	....	....	....	....	Measles	Good.....	"
32	9	5	Anæmia, 1	....	....	....	....	Measles	"	Clean, but not in order.
20	3	1	Nervous, 1	....	....	1	....	Measles and chicken-pox	"	Yes.
25	4	1	Acne, 1	....	....	....	....	Measles	"	"
29	5	2	Anæmia, 1	....	....	....	....	Measles; diphtheria, 1..	"	"
21	4	3	Catarrh of throat, 1; eczema, 1	....	....	....	1	Measles	"	"
3	....	....	.....	....	....	....	....	Measles	No water supply..	"
12	4	....	.....	....	....	....	....	Measles	Good.....	"
13	4	1	Uncleanliness, 1; acne, 1.....	....	....	....	....	Measles	"	"
10	2	2	.....	....	....	....	....	Measles	No water supply..	"
14	3	....	Acne, 1; inflamed throat, 1....	....	....	....	....	Measles	Good.....	"
10	2	....	.....	....	....	....	....	Measles	No water supply..	"
19	3	4	.....	....	....	....	....	Measles	Good.....	Overcrowded.
125	12	14	Infantile paralysis, 1; acne, 3; catarrh, 1; eczema, 11; otorrhœa, 1; defective speech, 1; stammering, 1	....	....	....	....	Measles; chicken-pox; mumps	"	Yes.
55	4	1	.....	....	....	....	....	Measles and chicken-pox	"	"
13	1	....	.....	....	....	....	....	Measles and chicken-pox	"	"
12	1	....	.....	....	....	....	....	Measles and chicken-pox	"	"
21	1	....	.....	....	....	....	....	Measles and chicken-pox	"	"
382	50	4	Nervous, 1; pulmonary, 1; cardiac, 4; anæmia, 10; unclean, 1	6	3	8	3	Mumps, 33; chicken-pox, 24; whooping-cough, 2	Lighting fair	Good.
339	23	16	Nervous, 2; pulmonary, 3; cardiac, 9; anæmia, 5; unclean, 4	13	....	9	....	Measles, 7; mumps, 1; chicken-pox, 1; whooping-cough, 1	"	"
282	23	7	Pulmonary, 2; cardiac, 3; anæmia, 1	9	....	13	....	Measles, 2; mumps, 5; chicken-pox, 6; scarlet fever, 1	"	"

RURAL MUNICIPALITY

Name of School.	Medical Inspector.	School Nurse.	No. of pupils enrolled.	No. of pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Vancouver, South.--*Continued:*											
General Wolfe	L. O. Griffin	H. Bone	491	435	18	2	18	17	5	2	56
General Brock	"	"	243	235	3	....	12	8	12	3	50
Sir Wm. Van Horne	"	"	232	223	12	....	11	12	9	3	28
Sir Alex. Mackenzie	"	"	494	471	16	....	20	12	22	3	53
Walter Mowberly	"	"	255	253	17	....	6	6	5	4	29
Richard McBride	"	"	381	364	15	....	15	12	11	....	50
Sexsmith	"	"	120	118	....	1	7	5	8	....	25
Champlain	"	"	24	21	....	....	1	1	1	....	8
Connaught	"	"	50	37	1	....	2	....	2	....	11
Norquay	"	"	201	201	8	....	13	8	16	4	35
Secord	"	"	112	111	5	....	6	2	4	4	22

RURAL AND

Albert Canyon	J. H. Hamilton		14	13	....	....	....	....	....	....	1
Albert Head	C. P. Higgins		16	13	....	....	1	....	1	1	1
Annable	John Nay.	Mrs. Campbell	14	14	....	....	....	....	....	3	5
Arrowhead	J. H. Hamilton		20	18	....	....	....	....	....	....	3
Ashcroft	R. Wightman		57	55	....	....	1	....	5	5	5
Athalmer	P. W. Turnor		10	8	....	....	2	2	....	....	5
Barkerville	M. Callanan		12	12	....	....	....	....	....	....	....
Barnston Island	G. Morse		10	9	1	....	....	....	....	1	2
Barriere River	G. W. Irving.		13	12	....	....	1	....	....	1	....
Barriere Power-house	"		6	6	....	....	....	....	....	....	....
Baynes Lake	D. Black		45	40	6	....	2	....	2	2	12
Beaton	J. H. Hamilton		11	11	....	....	....	....	....	....	2
Begbie	"		21	14	....	....	....	....	1	1	1
Berrydale	W. Truax		7	7	....	....	....	....	....	....	1
Big Eddy	J. H. Hamilton.		31	28	....	....	....	....	....	....	4
Blueberry	J. Bain Thom	Miss Hyde	8	8	1	....	....	....	....	3	3
Boston Bar	H. R. Fort		9	8	2	1	3	1	2	1	1
Bowie	J. H. Hamilton		14	13	....	1	....	....	....	....	2
Bowser	H. E. Langis		6	3	....	....	....	....	....	....	....
Brechin	T. J. McPhee	Miss C. Collishaw	95	94	....	....	1	....	3	2	13
Brisco	P. W. Turnor		14	12	....	1	....	1	....	....	6
Cache Creek	R. Wightman		12	12	1	....	....	....	1	1	1
Campbell River	W. F. Shaw		....	17	1	....	4	....	....	2	2
Cartier	J. H. Hamilton		26	18	....	....	....	....	1	1	3
Cawston	Robert Elliott		25	21	....	....	2	1	2	2	2
Cedar, East	T. J. McPhee	Miss C. Collishaw	9	8	....	....	....	....	....	1	....
Cedar, North	"		60	55	....	1	....	....	3	6	12
Cedar, South	"		32	32	....	....	1	....	1	1	1
Chase River	"		71	62	....	....	1	....	3	3	9
Chaumox	No report for 1916-17.										
Christina Lake	W. Truax		6	6	....	....	....	....	....	....	....
Chu Chua	H. H. Murphy		14	10	....	....	....	....	....	....	2
Columbia Gardens	J. Bain Thom	Mrs. Campbell	15	14	....	....	....	2	2	2	4
Colwood	A. E. McMicking		26	13	....	....	1	....	....	1	3
Concord	J. C. Elliott		12	11	....	....	....	2*	....	....	....
Craigellachie	J. H. Hamilton		14	12	....	....	....	....	....	....	2
Crawford Creek	"		8	5	....	....	....	....	1	1	1
Cultus Lake	J. C. Elliott		11	9	....	....	....	....	2	....	2
Departure Bay	T. J. McPhee	Miss C. Collishaw	19	19	....	....	....	....	1	1	1
Dewdney	H. D. Leitch		32	28	6	....	2	....	....	3	1
Elko	D. Black		29	29	6	....	1	....	3	2	14
Erie	John Nay	Mrs. Campbell	15	14	....	....	....	1	1	4	8
Errington	H. E. Langis		20	18	....	....	2	....	....	....	1

SCHOOLS.—*Concluded.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
324	46	10	Cardiac, 7; anæmia, 2; unclean, 2	11	1	8	4	Mumps, 109; chicken-pox, 20; whooping-cough, 1	Lighting fair	Good.
159	4	8	Nervous, 1; cardiac, 7	12	4	3	1	Measles, 6; mumps, 6; chicken-pox, 1; whooping-cough, 1	Good	Trough system.
145	17	12	Pulmonary, 1; cardiac, 5	7	....	2	....	Measles, 10; mumps, 5; whooping-cough, 2	Lighting fair	Good.
348	19	9	Pulmonary, 6; cardiac, 5; anæmia, 3	7	1	8	1	Measles, 34; mumps, 10; chicken-pox, 5	Lighting good	Trough system.
169	33	....	Cardiac, 4; anæmia, 2	8	....	....	2	Measles, 14; mumps, 4; chicken-pox, 22; whooping-cough, 1	Lighting fair	Good.
294	15	6	Cardiac, 2; anæmia, 4	4	....	3	1	Measles, 19; mumps, 8; chicken-pox, 30	"	"
82	7	....		....	....	1	....	Chicken-pox, 4	Good	"
18	....	....		....	....	3	....		"	Chemical toilet.
32	6	....		3	....	....	....	Mumps, 15; whooping-cough, 1	"	Good.
167	25	5	Cardiac, 3	2	2	4	....	Chicken-pox, 20; scarlet fever, 1	"	"
84	9	....	Anæmia, 2	....	....	....	....	Measles, 6; mumps, 5; chicken-pox, 1; whooping-cough, 1	"	"

ASSISTED SCHOOLS.

6	....	1		....	....	....	....		Good	Yes.
2	....	....		....	....	....	....		Poorly lighted	"
8	....	....		....	....	....	....		Good	"
9	....	6		....	....	....	....		"	"
17	2	2		....	....	....	....	Whooping-cough	"	Good.
9	....	2		....	....	....	....		"	"
....	....	....		....	....	....	....			One, another recommended.
4	1	2		....	....	....	....		Satisfactory	Satisfactory.
2	....	....	Mitral regurgitation, 1	....	....	....	....		"	Clean.
2	....	....		....	....	....	....		"	"
22	1	1		....	....	....	....		Very good	"
....	....	5		....	....	....	....		Good	Yes.
3	....	....		....	....	....	....		Fair	"
1	....	....		....	....	....	....		Rather poor bldg.	Fair.
12	....	....		....	....	....	....		Good	Yes.
3	....	....		....	....	....	1		Fair	Good.
6	2	1	Orthopædic defects, 2	....	....	....	....	Poliomyelitis, 1	"	Yes.
3	....	5		....	....	....	....		Good	"
....	....	....		....	....	....	....		"	Clean.
13	31	....		....	....	....	....		"	Divs. 1 and 2 good, and 3 crowded.
2	....	....		....	....	....	....		Fair	Fairly so.
....	1	1		....	....	....	....		Good	Good.
10	....	....	Orthopædic defect, 1	....	....	....	....		"	Yes.
3	....	4		....	....	....	....		"	Bad.
7	1	4		....	....	....	....	Measles	Poor heating	Fair.
2	....	1		....	....	....	....		Good	Good.
14	....	....		....	....	....	....		Crowded	"
1	....	....		....	....	....	....		Good	"
15	1	1	Impetigo, 1	....	....	....	1		"	"
2	....	....		....	....	....	....		"	"
6	....	....		....	....	....	....		Satisfactory	Yes.
6	....	1		....	....	....	....		Fair	"
1	....	....		....	....	....	....		No	"
8	....	....	Tongue-tied, 1	....	1	....	....		Fair	Fair.
1	....	3		....	....	....	....		Good	Yes.
1	....	4		....	....	....	....		"	"
5	....	....	Anæmia, 2	....	....	....	....		Fair	Clean.
3	....	....		....	....	....	....		Good	Good.
13	7	6		....	....	....	....		Well ventilated and heated	Well ventilated. and heated.
14	1	....		....	....	....	....		Very good	Clean.
8	....	1	Cleft palate, 1; club-foot, 1	....	....	....	....		Good	Yes.
2	....	....	Coryza, 3	....	2	....	....		Ventilation poor	Clean.

RURAL AND ASSISTED

Name of School.	Medical Inspection.	School Nurse.	No. of Pupils enrolled.	No. of Pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Extension	P. J. Emerson		92	89	....	....	1	1	1	1	47
Ferguson	J. H. Hamilton		15	13	....	....	....	....	....	....	4
Fife	W. Truax		20	18	....	....	1	....	....	....	3
Flagstone	D. Black		25	23	2	....	....	....	1	1	4
Fort George	C. Ewart		49	44	1	3	3	....	1	....	9
French Creek	H. E. Langis		18	15	1	....	2	1	....	....	1
Fruitvale	J. Bain Thom	Mrs. Campbell	41	40	1	1	1	....	....	5	13
Galena Bay	J. H. Hamilton		11	9	....	....	....	....	....	....	....
Galloway	D. Black		12	8	....	....	1	....	....	1	7
Glenrosa	Wm. Buchanan		8	7	....	....	....	....	....	1	....
Goldstream	A. E. McMicking		10	9	....	....	....	....	....	....	2
Granby Bay	L. Broe	Miss McTaggart	112	113	6	2	12	2	4	4	27
Hall's Landing	J. H. Hamilton		21	19	....	....	....	....	3	3	3
Happy Valley	A. E. McMicking		15	11	....	....	1	....	....	3	4
Harewood	T. J. McPhee	Miss C. Collishaw	279	260	2	1	13	9	24	28	65
Hat Creek	R. Wightman		8	8	....	....	....	....	....	....	....
Hatzic Prairie	H. D. Leitch		8	8	....	....	....	....	....	....	1
Heffley Creek	H. H. Murphy	Miss Frame	23	13	....	....	....	....	....	....	2
Hedley	Robert Elliott		52	50	....	....	4	2	3	3	5
Highland	A. E. McMicking		8	7	....	....	....	....	....	1	1
Hillier	H. E. Langis		9	8	....	....	....	....	....	....	....
Hope	J. C. Elliott		43	41	....	....	....	3	2	1	4
Hope Station	"		13	13	....	....	....	1	....	....	4
Invermere	P. W. Turner		20	20	....	....	2	1	....	....	5
Jaffray	D. Black		38	37	2	1	....	....	....	3	14
Keefers	No report 1916-17.										
Keremeos	Robert Elliott		35	32	1	1	3	1	4	5	6
Kettle River, North	W. Truax		14	11	....	..	1	....	....	....	2
Killarney	D. McCaffrey		103	100	..	....	2	....	....	....	20
Langford	A. E. McMicking		22	18	....	....	....	....	....	1	5
Lucerne	S. Petersky		20	18	....	....	5	....	2	1	10
Lytton	H. R. Fort		28	26	5	4	3	3	9	6	7
Malakwa	J. H. Hamilton		24	23	....	1	....	....	2	2	2
Meadow Spur	John Nay	Mrs. Campbell	11	9	....	....	1	....	....	1	2
Metchosin	C. P. Higgins		33	22	....	....	....	....	3	2	3
Mill Creek	J. R. Davies		39	38	1	1	2	2	2	2	11
Montrose	H. E. Langis		9	9	....	....	....	....	....	....	....
McGuire	D. Black		11	10	1	....	....	....	....	....	4
Nanaimo Bay	T. J. McPhee		76	72	1	....	2	1	6	7	12
Nanoose Bay	H. E. Langis		23	22	....	....	1	....	....	....	....
New Denver	J. E. Brouse		66	66	1	5	2	....	1	1	9
Nickel Plate	Robert Elliott		14	11	....	....	....	....	2	2	2
Nicomen	H. D. Leitch		20	18	....	....	....	....	1	....	2
Nicomen, North	"		15	15	....	....	....	....	....	....	2
Nine-mile	J. Bain Thom	Mrs. Campbell	9	9	....	....	....	....	....	1	3
North Bend	H. R. Fort		41	38	4	5	10	1	10	6	8
Northfield	T. J. McPhee		59	55	....	....	1	1	1	2	4
Ocean Falls	John Christie		40	39	....	....	3	....	2	2	6
Olalla	Robert Elliott		13	12	....	....	1	....	1	....	....
Otter Point	W. D. Calvert		25	22	....	....	1	....	....	....	2
Parksville	H. E. Langis		35	33	..	..	....	....	....	....	....
Powell River	Andrew Henderson		150	150	3	1	6	3	10	20	50
Princeton	D. McCaffrey		103	100	....	....	2	....	....	....	20
Princeton, East	"		23	17	....	....	....	2	....	....	3
Qualicum Beach	H. E. Langis		39	36	....	....	....	....	....	....	2
Qualicum, Little	"		13	9	....	....	1	....	....	....	....
Quesnel	G. R. Baker		42	41	....	....	2	1	1	1	3
Rocky Point	C. P. Higgins		33	22	....	....	....	....	3	2	3
Rosebery	J. E. Brouse		8	8	....	....	....	....	....	....	1
Roosville	D. Black		8	6	2	....	....	....	....	....	3
St. Elmo	J. C. Elliott		18	17	....	....	3	3	3	1	3
Salmo	John Nay	Mrs. Campbell	42	38	....	....	1	....	1	3	8
Savona	R. Wightman		12	12	....	....	....	....	....	....	3
Silverton	J. E. Brouse		67	60	....	....	3	....	2	1	7
Slocan City	"		70	66	1	1	4	....	1	....	

SCHOOLS.—*Continued.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions, specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
72	....	5	Chorea, 8.	....	....	....	....	....	Good.	Fair.
....	....	4	....	....	....	....	....	....	"	Yes.
6	1	....	....	....	....	....	....	....	"	Fair.
9	....	....	....	....	....	....	....	....	Very good	Clean.
20	12	5	....	....	....	....	....	Typhoid, 2	Good	"
....	....	....	....	....	....	....	....	....	"	Good.
12	....	....	Chorea, 1.	....	....	....	....	....	"	Yes.
1	1	1	....	....	....	....	....	....	Excellent	"
3	....	....	....	....	....	....	....	....	Very good	Clean.
....	....	....	....	....	....	....	....	....	Satisfactory	Satisfactory.
....	....	....	....	....	....	....	....	....	No	Yes.
62	21	11	Nervous, 2; heart, 2; scoliosis, 5; pigeon-breast, 1	....	....	....	....	Typhoid, 1; mumps, 24.	Good	"
5	....	2	....	....	....	....	....	....	"	"
1	....	....	....	....	....	....	....	....	No	"
99	10	1	....	....	....	....	....	....	Good	Good.
4	....	1	....	....	....	....	....	Whooping-cough	"	"
2	1	....	....	....	....	....	....	....	Well ventilated	Yes.
5	....	....	....	....	....	....	....	Scarlet fever, 3	Satisfactory	"
11	....	11	....	....	....	....	....	....	First class	Good.
....	....	....	....	....	....	....	....	....	No	Yes.
....	....	....	....	....	....	....	....	....	Heating insufficient	Good.
26	....	3	Anæmia, 1	....	....	....	....	....	Good	"
6	....	2	....	....	....	....	....	....	Fair	Poor.
13	....	2	....	....	....	....	....	....	Good	Good.
24	....	....	Alopecia, 1.	....	....	....	....	....	Very good	Clean.
10	1	13	....	....	....	....	....	Measles.	Fair	Good.
4	2	....	....	....	....	....	....	....	Rather poor ventilation	Fair.
9	5	31	Bronchitis, 3; la grippe, 12.	....	....	....	....	Measles, 15	Good	Good.
1	....	....	....	....	....	....	....	....	Stove too small	Yes.
17	16	7	Chorea, 1; pharyngitis, 6.	....	....	....	....	Mumps, 1	Good, fair ventilation	"
14	7	5	Cardiac, 1; orthopædic defects, 3	....	....	....	....	....	Fair	Adequate but not clean.
4	....	3	....	....	....	....	....	....	First class	Yes.
6	....	....	....	....	....	....	....	....	Fair	Fair.
3	....	....	....	....	....	....	....	....	Good	Yes; fair.
26	1	....	Mitral regurgitation, 1	....	....	....	....	....	"	Good.
....	....	....	....	....	....	....	....	....	"	Should be repaired.
6	....	....	....	....	....	....	....	....	Very good	Clean.
19	2	....	....	....	1	....	....	Diphtheria, 3	Good	Good.
....	....	....	....	....	....	....	....	....	"	"
2	8	9	Cardiac, 3; chest deformity, 1.	....	....	....	....	....	Senior school poorly ventilated	Yes.
3	1	2	....	....	....	....	....	....	Fair	Fair.
9	2	2	Nervous and cardiac, 1	....	....	....	....	....	Good	Yes.
4	2	....	....	....	....	....	....	....	"	"
1	....	1	....	....	....	....	....	....	"	"
11	11	5	Cardiac, 2; pulmonary, 1; orthopædic defects, 3	....	....	....	....	....	"	Adequate and fairly clean.
7	....	....	....	....	....	....	....	....	Very good	Good.
5	1	1	Cardiac, 1; nervous, 1,	....	....	....	....	Whooping-cough and chicken-pox	Excellent	Yes.
4	....	3	....	....	....	....	....	....	Fair	Fair.
4	....	....	....	....	....	....	....	Chicken-pox, 12; measles, 1; whooping-cough, 2	New; efficient	Yes.
....	....	....	....	....	....	....	....	Whooping-cough, 1	Good	Good.
15	1	1	....	....	....	....	....	....	"	"
9	5	31	La grippe, 12; bronchitis, 3.	....	....	....	....	Measles, 15	"	"
7	....	12	La grippe, 5.	....	....	....	....	Measles, 4	"	"
....	....	....	....	....	....	....	....	....	Ventilation and heating fair	Clean.
2	....	....	....	....	....	....	....	....	Good	"
6	....	2	....	....	....	....	....	....	"	Yes.
3	....	....	....	....	....	....	....	....	"	Yes; fair.
1	4	1	....	....	....	....	....	....	Satisfactory	Being renovated.
2	1	....	....	....	....	....	....	....	Very good	Clean.
10	....	....	....	....	....	....	....	....	Fair	Poor.
15	....	1	....	....	....	....	....	....	Good	Yes.
7	....	....	....	....	....	....	....	....	"	Good.
2	5	9	Cardiac, 6; tubercular hip, 1; chronic bronchitis, 1	....	....	....	....	....	Satisfactory	Yes.
....	2	7	Cardiac, 2; strabismus, 1	....	....	....	....	....	"	"

RURAL AND ASSISTED

Name of School.	Medical Inspection.	School Nurse.	No. of Pupils enrolled.	No. of Pupils examined.	Malnutrition.	Defective Mentality.	Defective Vision.	Defective Hearing.	Defective Nasal Breathing.	Adenoids.	Enlarged Tonsils.
Smithers	C. G. G. Maclean		34	28	....	1	2	1	1	2	11
Solsqua	J. H. Hamilton		15	14	....	....		...	2	2	4
Sooke	W. D. Calvert		25	22	....	....	1	....	....	....	2
Sooke Harbour	"		12	12	....	....	1	....	....	....	....
Standard Mine	J. E. Brouse		26	25	2	....	....	....	3	....	4
Telegraph Creek	Edward Rice		30	24	4	2	7	1	5	1	10
Three Forks	W. E. Gomm		8	8	....	....	....	....	...	1	1
Trout Lake	J. H. Hamilton		19	14	....	....	....	....	....	....	....
Tulameen	D. McCaffrey		10	10	....	1	1	....	....	....	....
Voigt Camp (Copper Mountain)	"		15	15	....	....	....	....	1	....	3
Waldo	D. Black		65	59	6	....	2	....	1	3	16
Walhachin	R. Wightman		9	9	1	....	....	....	....	1	1
Waterloo	T. J. McPhee		14	13	....	....	....	....	....	....	1
Wellington	"		44	36	...	1	2	...	2	2	4
Wellington, East	"		26	26	....	....	....	....	....	1	3
Wellington, South	"		130	123	....	....	1	1	3	7	18
Westbank	Wm. Buchanan		25	25	....	....	....	....	....	....	4
Westview	Andrew Henderson		14	10	....	....	....	....	1	2	4
Wilmer	P. W. Turnor		13	10	....	....	....	....	....	....	1
Windermere	"		9	9	....	....	....	....	....	....	5
Ymir	John Nay	Mrs. Campbell	39	36	....	....	1	....	1	5	12

SCHOOLS.—*Concluded.*

Defective Teeth.	Enlarged Glands.	Goitre.	Other Conditions, specify (Nervous, Pulmonary, Cardiac Disease, etc.).	Vermin.	Scabies.	Impetigo.	Ringworm.	Acute Fevers which have occurred during the Past Year.	Condition of Building. State if crowded, poorly ventilated, poorly heated, etc.	Closets. State if clean and adequate.
8	7	1	Whooping-cough, 1	....	....	....	....	.....	Excellent	Good.
5	1	1	.....	....	....	....	....	.....	Good.....	Yes.
4	....	....	.....	....	....	....	....	Chicken-pox, 12; measles, 1; whooping-cough, 2	New; efficient....	"
....	....	....	.....	....	....	....	....	.....	"	"
1	3	3	Cardiac, 1; corneal ulcer, 1	....	....	....	....	.....	Satisfactory	"
16	3	....	Lateral curved spine	....	1	....	1	.....	Inadequate and poorly heated	Not sanitary.
1	....	....	.....	....	....	....	....	.....	Fair	Yes.
4	....	4	.....	....	....	....	....	.....	Good.....	"
2	....	3	.....	....	....	....	....	.....	"	Good.
2	....	2	.....	....	....	....	....	Measles, 2	"	"
36	3	2	.....	....	....	....	....	Influenza.....	Very good.....	Clean.
6	....	1	.....	....	....	....	....	.....	Not arranged properly	Good.
2	....	....	.....	....	....	....	....	.....	Good.....	"
5	....	....	Neurotic, 1	....	....	....	....	.....	"	"
3	....	....	.....	....	....	....	....	.....	"	"
31	4	1	.....	....	....	....	....	Four	Fair	Fair.
1	....	16	.....	....	....	....	....	.....	Satisfactory	Satisfactory.
....	....	....	Cardiac, 1	....	....	....	....	.....	Good.....	Good.
6	....	....	.....	....	....	....	....	.....	"	"
3	....	1	.....	....	....	....	....	.....	"	"
21	....	....	.....	....	....	....	....	.....	"	Yes.

REGISTRAR'S REPORT UNDER THE VITAL STATISTICS ACT.

H. E. Young, M.D.,
Secretary, Provincial Board of Health, Victoria, B.C.

VICTORIA, B.C., February 10th, 1918.

SIR,—Herewith please find tabulated returns of Vital Statistics for the year 1917.

I have the honour to be,
Sir,
Yours obediently,
MUNROE MILLER,
Deputy Registrar of Births, Deaths, and Marriages.

Following is the Forty-fifth Annual Report of Births, Deaths, and Marriages registered in this Province from January 1st to December 31st, inclusive, 1917, in accordance with section 5 of the "Vital Statistics Act":—

"The Registrar shall, as soon after the first day of January in each year as convenient, cause to be printed for public information a full report of the registered births, deaths, and marriages of the preceding year."

The section is quoted not only to show manner and authority for issuing an annual report, but for the purpose of drawing attention to the difficulties attending same.

As a preliminary the following list of offices of District Registrars of Births, Deaths, and Marriages is inserted, showing the manner in which they are grouped for the convenience of this office, and full returns, as far as received, from the various groups for 1917:—

Victoria Division—
- Victoria City.
- Cowichan.
- Esquimalt.
- Oak Bay.
- Saanich.

New Westminster Division—
- New Westminster City.
- Burnaby.
- Coquitlam.
- Fraser Mills.
- Ladner.
- Langley.
- Maple Ridge.
- Mission.
- Matsqui.
- Port Coquitlam.
- Port Moody.
- Pitt Meadows.
- Sumas.
- Surrey.
- Outside.
- Chilliwack City.
- Chilliwack Township.
- Chilliwack, outside.

Nanaimo Mining Division—
- Nanaimo Division.
- Nanaimo, outside.
- Alert Bay.
- Comox-Cumberland.
- Comox, outside.
- Ladysmith.

Beaton, etc.—
- Beaton.
- Cranbrook.
- Fernie.
- Golden.
- Kaslo.
- Nakusp.
- Nelson.
- New Denver.
- Revelstoke.
- Rossland.
- Slocan City.
- Trail.
- Wilmer.

Alberni, etc.—
- Alberni.
- Atlin.
- Bella Coola.
- Clayoquot.
- Fort Fraser.
- Hazelton.
- Fort St. John.
- Hudson Hope.
- Pouce Coupe.
- Porter's Landing.
- Prince Rupert.
- Quatsino.
- Queen Charlotte.
- Stewart.
- Telegraph Creek.

Ashcroft, etc.—
- Ashcroft.

Ashcroft, etc.—*Concluded.*
- Barkerville.
- Fort George.
- Tete Jaune Cache.
- Clinton.
- Lillooet.
- Quesnel.
- 150-Mile House.
- Yale.

Fairview, etc.—
- Fairview.
- Greenwood.
- Grand Forks.

Fairview, etc.—*Concluded.*
- Kamloops.
- Nicola.
- Princeton.
- Vernon.

Vancouver Division—
- Vancouver City.
- South Vancouver.
- Point Grey.
- North Vancouver.
- West Vancouver.
- Unorganized.
- Richmond.

Under proper headings, and in tables of the returns of births, deaths, and marriages, will be found returns for each of the above places, but for expedition the gross for each division or group is herewith appended for years 1916 and 1917. The loss or gain in each becomes quickly apparent.

	Births.		Deaths.		Marriages.	
	1916.	1917.	1916.	1917.	1916.	1917.
Victoria	1,516	1,398	654	589	516	449
Nanaimo	647	575	233	218	119	112
Vancouver	3,866	3,658	1,506	1,549	1,454	1,394
New Westminster	1,094	1,150	453	495	311	279
Ashcroft	196	196	77	74	54	44
Fairview	1,086	1,057	443	364	299	218
Alberni	329	357	127	144	94	107
Beaton	1,107	1,059	394	463	322	258
Totals	9,841	9,450	3,887	3,896	3,169	2,861

After a careful study of the question of population of the Province, and a consultation with the Inspector of Municipalities, it was determined to rely principally on his computation, with the following result:—

Population of cities		227,675
Population of municipalities		126,575
Estimated population in unorganized territory		20,000
Natural increase, registered births over registered deaths		5,554
Total		379,804
Estimated, 1916	383,380	
Estimated, 1917	379,804	
Loss	3,576	

Through lack of positive information in the above matter it is assumed that the figures are correct, and calculation as to rates, comparisons, etc., will be made on the basis of a population of 379,804.

Following are the registrations for:—

	1915.	1916.	1917.
Births	10,516	9,841	9,450
Deaths	3,832	3,887	3,896
Marriages	3,393	3,169	2,861
Totals	17,741	16,897	16,207

Following are the rates per thousand of population for births, deaths, and marriages for the years 1916 and 1917. In considering the rates it must be remembered that the population in the respective years was placed at 383,380 and 379,804.

	1916.	1917.
Province—		
Registered births	9,841 = 25.66	9,433 = 24.83
Registered deaths	3,887 = 10.14	3,896 = 10.25
Registered deaths, less still-born	3,686 = 9.60	3,721 = 9.79
Registered marriages	3,169 = 8.27	2,861 = 7.53
Vancouver City—		
Registered births	2,686 = 28.07	2,670 = 27.81
Registered deaths	1,240 = 12.96	1,307 = 13.61
Registered deaths, less still-born	1,125 = 11.65	1,223 = 12.74
Registered marriages	1,152 = 13.08	1,191 = 12.40
Victoria City—		
Registered births	1,106 = 30.29	995 = 26.97
Registered deaths	533 = 14.59	476 = 13.03
Registered deaths, less still-born	508 = 13.90	456 = 12.48
Registered marriages	420 = 12.59	382 = 10.46
South Vancouver—		
Registered births	579 = 20.60	480 = 17.07
Registered deaths	112 = 3.98	88 = 3.13
Registered deaths, less still-born	97 = 3.45	76 = 2.70
Registered marriages	110 = 3.91	97 = 3.09
Remainder of Province—		
Registered births	5,470 = 24.47	5,288 = 24.12
Registered deaths	2,002 = 9.16	2,025 = 9.23
Registered deaths, less still-born	1,956 = 8.76	1,966 = 8.96
Registered marriages	1,387 = 6.21	1,191 = 5.43

In arriving at the foregoing rates the population of the Province in 1916 was taken as 383,380; Vancouver City as 95,660; Victoria as 36,510; South Vancouver as 28,106; balance of Province as 223,104.

For 1917 the population of the Province has been taken as 379,804; Vancouver City as 96,000; Victoria as 36,510; South Vancouver as 28,106 balance of Province as 219,188.

Following is a classified list of deaths occurring in British Columbia for the years 1913 to 1917, inclusive:—

	1913.	1914.	1915.	1916.	1917.	Average.
1. General diseases	997	856	895	936	965	929.8
2. Diseases of nervous system and organs of special sense	404	358	336	389	380	373.4
3. Diseases of the circulatory system	501	403	479	456	540	475.8
4. Diseases of the respiratory system	458	345	340	494	439	415.2
5. Diseases of the digestive system	300	329	260	224	268	276.2
6. Non-venereal diseases of the genito-urinary system and annexa	238	207	163	206	204	203.6
7. The puerperal state	53	65	50	50	59	55.4
8. Diseases of the skin and cellular tissue	12	13	7	15	23	14.0
9. Diseases of the bones and organs of locomotion	.....	.....	1	3	3	1.4
10. Malformations	9	42	51	55	51	41.6
11. Diseases of early infancy	765	579	526	438	405	542.6
12. Old age	68	66	70	80	54	67.6
13. Affections produced by external causes	717	642	583	473	455	574.0
14. Ill-defined, including executions	97	72	71	68	50	71.6
Totals	4,619	3,977	3,832	3,887	3,896	4,042.2

The following tabulated statement of deaths from various diseases covering a period of eighteen years is submitted for consideration, and it is hoped, after perusal of same by parties peculiarly interested, that the word "pneumonia" will lose its popularity, and for the future in returns of death the "prime cause, followed by pneumonia," will be substituted. If this course can be adopted a far more reliable report *re* children's diseases can be prepared.

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	Totals.	Average for 18 years.
Typhoid fever	79	35	32	24	42	34	39	63	72	55	102	92	99	85	42	32	23	24	974	54.11
Whooping-cough	6	...	6	12	3	4	4	26	9	18	15	23	15	27	23	9	37	21	258	14.33
Diphtheria	7	11	31	21	16	10	15	21	29	14	23	68	36	35	11	11	18	19	386	21.44
Scarlet fever	2	7	7	17	8	4	6	4	5	16	14	31	12	18	3	...	1	7	162	9.00
Measles	1	...	6	1	1	1	2	10	6	1	7	11	13	11	1	14	12	6	104	5.77
Smallpox	...	...	...	.	2	...	1	...	1	...	1	...	...	...	...	...	...	3	8	0.44
Diarrhœa and enteritis	35	29	30	22	48	48	45	53	33	59	74	53	130	113	108	72	35	53	1,040	57.77
Dysentery	6	4	6	2	4	4	6	9	11	12	51	24	23	24	13	14	14	7	234	13.00
Purulent infection and septicæmia	11	13	11	16	19	15	11	22	19	30	31	30	39	10	45	34	29	45	430	23.9
Influenza	7	3	6	11	6	7	2	26	5	10	5	10	10	11	11	18	36	17	211	11.72
Pneumonia	98	102	155	115	104	100	110	217	152	153	164	237	258	195	183	157	228	224	2,952	164.00
*Bronchopneumonia	...	...	...	...	...	...	...	...	33	46	51	85	124	66	64	62	140	92	763	76.30
Bronchitis	22	26	22	19	24	16	20	47	44	36	42	60	63	51	47	47	49	36	671	37.28
Totals	274	230	312	260	277	243	261	498	419	450	580	724	822	646	551	470	622	554	8,193	.....

*Bronchopneumonia does not appear to have been segregated until 1908; consequently the average is for 10 and not 18 years.

Re cancer: The following statement is self-explanatory. The total number of deaths, 248, is 6.36 of all deaths and 0.65 per thousand of population.

	Male.	Female.	Total.
Victoria Division	28	33	61
New Westminster Division	14	9	23
Nanaimo Division	4	3	7
Beaton Group	5	5	10
Alberni Group	3	2	5
Ashcroft Group	..	..	..
Fairview Group	13	7	20
Vancouver Division	61	61	122
Totals	128	120	248

Re tuberculosis: Deaths from tuberculosis, all forms, are shown below. Total deaths, 413, being 10.6 of all deaths and 1.08 per thousand of population.

	Male.	Female.	Total.
Victoria Division	39	18	57
New Westminster Division	27	17	44
Nanaimo Division	10	7	17
Beaton Group	19	9	28
Alberni Group	5	4	9
Ashcroft Group	5	3	8
Fairview Group	38	31	69
Vancouver Division	111	70	181
Totals	254	159	413

Reference to both tuberculosis and cancer is made elsewhere.

The following information is presented as a comparative statement *re* the ages of decedents for the years 1916 and 1917:—

	1916.	1917.
Under 1 year	601	587
1 to 2 years	121	82
2 to 5 years	108	107
5 to 10 years	70	76
10 to 20 years	104	154
20 to 30 years	298	329
30 to 40 years	451	473
40 to 50 years	486	451
50 to 60 years	450	456
60 to 70 years	413	461
70 to 80 years	348	341
80 to 90 years	175	158
90 years and up	22	18
Age not given	37	28
Age and sex not given	2	..
Totals	3,686	3,721

In the above figures the still-born are not included with deaths under one year. There were 201 still-births reported in 1916 and 175 in 1917.

In connection with the above, it is worthy of note that, notwithstanding the heavy showing of infant mortality in each year, if we take the columns of each year, from infancy to 39 years, the totals are respectively 1,753 and 1,808, whilst the columns from 40 to final age returns stand respectively 1,933 to 1,913. This shows a wonderful evenness and calls attention to the longevity of the people of the Province. From the age of 60 years up, we have 958 in 1916 and 978 in 1917.

In compiling this report we have, necessarily, been compelled to scan the annual reports of this Department for several years back. Whilst so engaged we chanced upon a paragraph in the report for 1914: "Another piece of work undertaken and almost completed has been the arrangement and placing in alphabetical order of all the returns received by this office since 1872. The documents from each district have been gathered together and bound, so that what belongs to Victoria, or any other place, may be found by itself under its proper year and letter. The undertaking entailed no little labour, but the results certainly justify the course pursued." The staff takes it for granted that all persons are entitled to rejoice when they have successfully accomplished an important undertaking. In this case the end of the task is so near that we announce its completion, and hold all returns duly placed under their respective districts and arranged in alphabetical order.

In the same report we find allusion to church registers. The different denominations have generally responded cheerfully, and for their co-operation we take this occasion to thank them; yet the greatest is still behind. Arrangements have finally been made whereby we have had placed at our disposal the records of the Church of England antedating the Oregon award by several years. With these documents duly classified and arranged, it is held that the Province of British Columbia may with pride compare records with any Province in the Dominion of Canada.

Re the matter of vital statistics of the Indians of British Columbia: Up to the year 1916 the registration of births, deaths, and marriages among Indians received no recognition at the hands of this Department, section 3 of the "Vital Statistics Act" preventing such registration:—

"3. The provisions of this Act shall apply to every person resident within this Province, whether such residence be permanent or temporary, and shall apply to all races and nationalities except persons who are Indians within the meaning of the Act of the Dominion Parliament respecting Indians."

In 1914 the Department of Indian Affairs at Ottawa took the matter up with the Government of this Province and urged amendment of our Act to the end that Indians should receive the same recognition under the Act as that accorded all other peoples. After considerable correspondence, which need not be introduced here, extending over a period of two years, a compromise was

effected, and the following amendment to the Act was made in 1916 and became a part of the laws of the land:—

"2. Section 3 of the 'Vital Statistics Act,' being chapter 81 of the Statutes of 1913, is hereby repealed, and the following is substituted therefor:—

"'3. (1.) The provisions of this Act shall apply to every person, of whatever race or nationality, resident within this Province, but shall not, except as herein provided, apply to the persons who are Indians within the meaning of the Act of the Dominion Parliament respecting Indians.

"'(2.) For the purpose of compiling statistics of births, deaths, and marriages of such Indians, the Registrar may accept returns to be made monthly by the respective Indian Agents in the Province, and such returns shall be kept separate and apart from the other returns authorized or required by this Act, and shall be made according to the forms specially prepared by the Registrar.'"

From and after the passage of the amendment everything was done in regular order; the first thing, naturally, was the appointment of the various Indian Agents as Registrars, etc., for Indians only, as follows:—

"Provincial Secretary's Office,
October 26th, 1916.

"His Honour the Lieutenant-Governor in Council has been pleased to appoint the undermentioned Indian Agents to be Registrars under the 'Marriage Act,' and District Registrars of Vital Statistics, for Indians only:—

Name.	Agency.	Address.
W. R. Robertson	Cowichan	Duncan.
C. A. Cox	West Coast	Alberni.
R. E. Loring	Babine	Hazelton.
Iver Fougner	Bella Coola	Bella Coola.
John F. Smith	Kamloops	Kamloops.
R. L. T. Galbraith	Kootenay	Fort Steele.
H. Graham	Lytton	Lytton.
Chas. C. Perry	Nass	Prince Rupert.
Peter Byrne	New Westminster	New Westminster.
J. R. Brown	Okanagan	Vernon.
Thos. Deasy	Queen Charlotte	Masset.
W. S. Simpson	Stikine	Telegraph Creek.
W. J. McAllan	Stuart Lake	Fort Fraser.
Isaac Ogden	Williams Lake	Lac la Hache.
W. M. Halliday	Kwawkewlth	Alert Bay."

Special forms were printed, all necessary books and other supplies furnished and forwarded to the different agencies, in addition to which the Indian Department at Ottawa notified its various agents by circular letter of the amendment to the Act, etc., closing the letter with the following paragraph:—

"You will therefore receive instructions from the Registrar of Births, Deaths, and Marriages, fully instructing you in your duties as Registrar, and I am to inform you that the Department confirms your appointment as such and will be glad if you will endeavour to carry out any instructions that may be sent you by the Provincial Registrar."

Whilst the foregoing work was under way, our "exchanges" were closely watched in the hope that something bearing on Indian vital statistics might appear. The most pertinent coming under observation contains the following:—

"It has been generally believed that the white man's civilization was inimical to the red man. . . . It seems now that these conclusions were without basis in fact, and that the race is really increasing nearly as fast as the white race."

If such a condition has been rendered possible on one side of a national boundary-line, there is every reason to believe that it can be done on this side, and that the line itself will never rise and say: "Thus far shall civilization of the Indian come, and no farther."

In justification of the position assumed in the foregoing paragraph, we must be permitted to quote from the Annual Report of the Department of Indian Affairs. Therein is found that:—

British Columbia has an Indian population of	25,399
British Columbia has land under crop, acres	11,603
British Columbia has produced grain, roots, bushels	567,528
British Columbia has produced hay, tons	24,847
Representing a total value of	$598,329
Ontario, the premier Province, has an Indian population of	26,162
Ontario has land under crop, acres	16,180
Ontario has produced grain, roots, bushels	495,767
Ontario has produced hay, tons	31,958
Representing a total value of	$506,648

British Columbia standing above her nearest competitor by $91,681. And her Indian population is treated as a negligible quantity.

It may be urged that this trifling critique is out of place, but the facts tempted me and I wandered.

The reports from the Indian Agents as a whole are not satisfactory. In some cases the Agents have evidently taken considerable trouble, even gone out of their way, to comply with the instructions issued from this office, whilst others (particularly Okanagan and Williams Lake) have ignored the business entirely—no notice of any kind having been received for the whole year. In other cases, instead of reporting monthly, as per their instructions, the Agents apparently await the accumulation of a batch sufficiently large to fill an envelope before attempting to forward the documents to this office. However, this is only the first year, and hope still lives.

The following is a brief summary of the returns as received:—

Births	144
Deaths	310
Marriages	67
Total	521

Total registrations made for the year, 521 for a population of 25,399, the number given in the Report of the Department of Indian Affairs for 1915. The deaths exceed the births by 166, and we have record of only 67 marriages. Evidently there is a laxness somewhere which must be overcome.

The cash receipts for the year amount to $1,430.15, being $225.65 in excess of 1916.

Certificates issued for military purposes, as nearly as can be arrived at, stand between 4,000 and 5,000. The number is assumed because the offices in Victoria and Vancouver together have issued 3,455, to which must be added what was issued by the different District Registrars. The above certificates are issued free of charge.

The various forms of tabulated statements used in last year's report have been retained and some new ones introduced.

Letters received and dealt with in 1917, 4,590; notices received of marriage licences issued, 2,864; notices of births received from physicians (for Victoria Division only), 1,038. Whilst on this topic it may not be out of place to point out that, in addition to the regular work, the staff has in the last four years indexed, classified, and arranged in alphabetical order returns of births, deaths, and marriages numbering 184,525 lines.

I have the honour to be,

Sir,

Your obedient servant,

M. MILLER,

Deputy Registrar, Births, Deaths, and Marriages.

BIRTHS, 1917.

Mining Division.	Registrations in 1917.			Total Registrations.		Births in 1917.			Total Births.	
	Male.	Female.	Sex not given.	1917.	1916.	Male.	Female.	Sex not given.	1917.	1916.
Ainsworth—										
Kaslo	13	11	..	24	25	13	7	..	20	21
Arrow Lake—										
Nakusp	8	6	..	14	25	3	4	..	7	19
Atlin—										
Atlin	3	4	..	7*	2	2	4	..	6*	2
Ashcroft—										
Ashcroft	18	17	..	35	16	7	8	..	15	12
Alberni—										
Alberni	21	19	..	40	34	15	12	..	27	26
Bella Coola—										
Bella Coola	5	11	..	16	15	4	9	..	13	12
Cariboo—										
Barkerville	..	..	..	..	2	..	..	..	..	2
Fort George	21	34	..	55	79	19	31	..	50	70
Tete Jaune Cache	8	7	..	15	13	8	7	..	15	11
Clayoquot—										
Clayoquot	1	1	..	2	3	1	1	..	2	3
Clinton—										
Clinton	9	6	..	15	18	4	4	..	8	13
Fort Steele—										
Cranbrook	69	68	..	137	151	50	54	..	104	118
Fernie	98	105	..	203	243	82	77	..	159	198
Greenwood—										
Greenwood	47	34	..	81	97	34	26	..	60	74
Grand Forks—										
Grand Forks	47	30	..	77	81	33	28	..	61	63
Golden—										
Golden	22	18	..	40	41	20	10	..	30	35
Kamloops—										
Kamloops	149	154	..	303	326	100	104	..	204	249
Liard—										
Porter's Landing	..	1	..	1*	..	..	1	..	1*	..
Lardeau—										
Beaton	2	1	..	3	9	1	1	..	2	8
Lillooet—										
Lillooet	2	3	..	5	8	1	2	..	3	4
Nicola—										
Nicola	35	35	..	70	55	23	26	..	49	41
Nelson—										
Nelson	119	107	..	226	235	80	82	..	162	194
New Westminster—										
New Westminster	258	223	..	481	438	170	152	..	322	304
Burnaby	85	75	..	160	210	67	58	..	125	141
Chilliwack	63	71	..	134	143	44	52	..	96	99
Outside	196	179	..	375	303	132	122	..	254	224
Nanaimo—										
Nanaimo	160	150	..	310	355	114	106	..	220	261
Alert Bay	7	11	..	18	26	2	7	..	9	24
Comox	88	78	..	166	205	70	55	..	125	158
Ladysmith	37	44	..	81	61	23	33	..	56	49
Osoyoos—										
Fairview	43	37	1	81	61	31	31	1	63	46
Omineca—										
Hazelton	21	16	..	37	50	18	14	..	32	40
Fort Fraser	6	11	..	17	12	3	6	..	9	10
Portland Canal—										
Stewart	..	..	..	..	..	..	..	..	..	..
Peace River—										
Fort St. John	1	1	..	2*	..	1	..	..	1*	..
Hudson Hope	3	2	..	5*	..	1	1	..	2*	..
Pouce Coupe	12	7	..	19	10	10	6	..	16	7
Quesnel—										
Quesnel	13	14	..	27	31	9	9	..	18	26
150-Mile House	6	3	..	9	9	3	1	..	4	5
Quatsino—										
Quatsino	2	2	..	4	7	2	2	..	4	5
Queen Charlotte—										
Queen Charlotte City	11	8	..	19	12	9	4	..	13	11
Revelstoke—										
Revelstoke	64	58	..	122	129	51	49	..	100	105
Similkameen—										
Princeton	16	11	..	27	11	14	7	..	21	9
Slocan—										
New Denver	14	15	..	29	25	8	12	..	20	19
Slocan City Division—										
Slocan City	5	2	..	7	3	5	2	..	7	2
Stikine—										
Telegraph Creek	1	1	..	2*	2	..	1	..	1*	2
Carried forward	1,809	1,691	1	3,501	3,581	1,287	1,228	1	2,516	2,722

BIRTHS, 1917—*Concluded.*

Mining Division.	Registrations in 1917.			Total Registrations.		Births in 1917.			Total Births.	
	Male.	Female.	Sex not given.	1917.	1916.	Male.	Female.	Sex not given.	1917.	1916.
Brought forward	1,809	1,691	1	3,501	3,581	1,287	1,228	1	2,516	2,722
Skeena—										
Prince Rupert	105	74	..	179	181	82	62	..	144	143
Anyox	3	4	..	7	..	3	4	..	7	..
Trail Creek—										
Rossland	40	27	..	67	97	21	18	..	39	65
Trail	84	78	..	162	100	70	64	..	134	91
Trout Lake—										
Trout Lake	3	..	..	3	3	..	..	..	..	2
Vernon—										
Vernon	226	192	..	418	455	165	126	..	291	337
Vancouver—										
Vancouver City	1,424	1,246	..	2,670	2,686	1,064	944	..	2,008	1,992
North Vancouver City	74	56	1	131	166	63	42	1	106	136
North Vancouver District	21	13	..	34	40	17	10	..	27	34
South Vancouver	251	229	..	480	579	197	193	..	390	421
West Vancouver	2	6	..	8	16	1	5	..	6	11
Point Grey	73	49	..	122	139	46	38	..	84	116
Unorganized	39	27	..	66	86	30	21	..	51	72
Richmond	71	76	..	147	154	62	62	..	124	131
Victoria—										
Victoria City	517	478	..	995	1,106	381	363	..	744	836
Cowichan	49	53	..	102	101	37	35	..	72	86
Esquimalt	36	44	..	80	62	29	32	..	61	50
Oak Bay	22	22	..	44	53	18	15	..	33	45
Saanich	94	83	..	177	194	56	60	..	116	150
Windermere—										
Wilmer	7	15	..	22	21	7	12	..	19	21
Yale—										
Yale	19	16	..	35	20	11	11	..	22	14
Totals	4,969	4,479	2	9,450	9,840	3,647	3,345	2	6,994	7,475

* December returns not received.

DEATHS, 1917.

Mining Division.	Under 1 year, including still-born.	1 to 2 years.	2 to 5 years.	5 to 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	60 to 70 years.	70 to 80 years.	80 to 90 years.	90 and upwards.	Age not given.	Male.	Female.	Sex not given.	Total, 1917.	Total, 1916.	Still-born, 1917.
Ainsworth—																				
Kaslo	2	....	....	1	....	5	2	4	2	7	1	....	....	....	20	4	....	24	14	1
Arrow Lake—																				
Nakusp	2	....	....	....	....	....	1	1	3	1	....	....	....	....	4	4	....	8	8	....
Atlin—																				
Atlin	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	1	8	....
Ashcroft—																				
Ashcroft	3	....	....	....	3	2	....	....	2	1	....	....	....	....	8	3	....	11	8	....
Alberni—																				
Alberni	3	1	....	....	1	2	1	1	3	1	1	....	....	2	9	7	....	16	12	....
Bella Coola—																				
Bella Coola	....	....	....	1	1	1	4	1	2	1	....	....	....	....	10	1	....	11	4	....
Cariboo—																				
Barkerville	....	....	....	....	....	....	1	....	....	....	1	....	....	....	2	....	....	2	....	....
Fort George	5	....	....	....	2	1	2	2	1	2	....	....	....	1	12	4	....	16	21	....
Tete Jaune Cache	3	....	1	....	....	1	4	....	1	....	....	....	....	....	10	....	....	10	4	....
Clayoquot—																				
Clayoquot	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	1	3	....
Clinton—																				
Clinton	1	....	....	....	....	....	....	....	2	....	....	....	....	....	3	....	....	3	10	....
Fort Steele—																				
Cranbrook	16	2	3	1	....	5	5	5	4	5	....	....	....	2	29	19	....	48	43	3
Fernie	42	7	3	1	4	22	22	14	9	9	4	....	....	3	104	36	....	140	87	8
Greenwood—																				
Greenwood	13	....	1	1	....	2	1	2	2	4	5	....	...	1	24	8	....	32	28	....
Grand Forks—																				
Grand Forks	9	....	4	....	2	1	2	4	5	....	4	1	....	....	24	8	....	32	28	2
Golden—																				
Golden	1	....	....	....	1	2	2	1	2	....	....	....	....	1	9	1	....	10	18	....
Kamloops—																				
Kamloops	12	7	4	....	4	22	31	15	19	13	18	9	1	....	100	55	....	155	172	....
Liard—																				
Porter's Landing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Lardeau—																				
Beaton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....
Lillooet—																				
Lillooet	....	....	....	1	....	1	....	....	1	1	....	1	....	....	4	1	....	5	6	....
Nicola—																				
Nicola	....	....	....	....	....	1	5	3	4	1	1	....	....	2	11	6	....	17	22	....
Nelson—																				
Nelson	17	1	6	3	9	9	7	14	13	12	7	4	....	4	72	34	....	106	74	4
New Westminster—																				
New Westminster	44	4	7	5	12	15	30	38	20	34	21	11	2	....	146	97	....	243	212	18
Burnaby	10	2	....	1	1	3	5	1	....	4	7	1	...	....	24	11	....	35	47	1
Chilliwack	10	1	....	..	4	....	....	3	7	5	6	....	....	1	25	12	....	37	47	....
Outside	33	7	4	2	5	8	23	18	19	25	25	11	....	....	130	50	....	180	147	6
Nanaimo—																				
Nanaimo	17	....	6	1	2	12	11	15	11	10	9	5	....	....	60	39	....	99	114	....
Alert Bay	4	....	....	....	....	1	4	1	1	....	....	....	....	....	8	3	....	11	11	1
Comox	4	1	2	1	5	12	16	14	8	9	7	2	1	1	63	20	....	83	84	....
Ladysmith	7	2	4	....	1	3	2	2	1	1	2	....	....	....	9	16	....	25	24	....
Osoyoos—																				
Fairview	1	....	....	....	1	2	3	7	9	4	2	1	....	1	22	9	....	31	31	....
Omineca—																				
Hazelton	5	....	1	....	....	1	....	1	5	9	1	1	....	1	18	7	....	25	21	....
Fort Fraser	2	1	....	....	....	1	1	2	....	2	....	....	....	....	5	4	....	9	9	....
Portland Canal—																				
Stewart	....	....	....	....	....	1	....	....	1	1	....	....	....	....	3	....	....	3	1	....
Peace River—																				
Fort St. John	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hudson Hope	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pouce Coupe	....	....	....	1	....	....	1	....	....	1	....	....	....	....	2	1	....	3	4	....
Quesnel—																				
Quesnel	....	....	....	....	....	....	1	2	....	1	....	....	....	....	4	....	....	4	14	....
150-Mile House	....	....	....	....	....	....	1	1	1	....	1	1	....	....	3	2	....	5	2	....
Quatsino—																				
Quatsino	....	....	....	....	....	1	1	....	....	....	....	....	....	....	1	1	....	2	1	....
Queen Charlotte—																				
Queen Charlotte City	1	....	1	1	....	1	....	....	1	....	....	....	....	....	5	....	....	5	10	....
Revelstoke—																				
Revelstoke	14	....	3	1	2	3	2	6	4	3	1	....	....	1	30	10	....	40	42	....
Similkameen—																				
Princeton	1	....	....	....	2	4	....	1	....	1	2	1	....	....	5	7	....	12	16	....
Slocan—																				
New Denver	1	....	1	....	....	1	3	3	1	3	....	....	....	....	11	2	....	13	10	....
Slocan City Division—																				
Slocan City	1	....	1	.. ..	1	....	....	1	....	....	....	....	....	....	2	2	....	4	5	....
Carried forward	284	36	52	22	59	146	195	183	164	171	127	49	4	21	1032	485	....	1517	1425	44

DEATHS, 1917—*Concluded.*

Mining Division.	Under 1 year, including still-born.	1 to 2 years.	2 to 5 years.	5 to 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	60 to 70 years.	70 to 80 years.	80 to 90 years.	90 and upwards.	Age not given.	Male.	Female.	Sex not given.	Total, 1917.	Total, 1916.	Still-born, 1917.
Brought forward ..	284	36	52	22	59	146	195	183	164	171	127	49	4	21	1032	485	....	1517	1425	44
Stikine—																				
Telegraph Creek	....	....	....	....	....	....	2	....	....	2	....	....	....	....	4	....	....	4	2	....
Skeena—																				
Prince Rupert	14	2	1	....	....	7	14	9	6	6	1	1	....	2	52	11	....	63	52	1
Anyox	1	....	..	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....
Trail Creek—																				
Rossland	4	....	....	....	1	2	1	6	9	5	1	1	1	....	19	12	....	31	45	1
Trail	10	....	2	1	....	3	5	4	6	1	....	1	....	....	25	8	....	33	40	2
Trout Lake—																				
Trout Lake	....	....	....	....	....	....	1	1	....	....	....	....	....	....	2	....	....	2	....	....
Vernon—																				
Vernon	12	3	3	3	6	8	10	6	10	11	8	3	2	....	54	31	....	85	146	....
Vancouver—																				
Vancouver City	273	24	28	28	49	100	177	153	157	160	103	49	5	1	810	497	....	1307	1240	84
North Vancouver	13	1	1	4	5	3	4	5	9	6	6	1	....	..	28	30	....	58	36	7
North Vancouver Dist.	2	....	....	....	1	2	1	1	3	....	1	1	....	....	8	4	....	12	11	....
South Vancouver	27	5	2	4	5	2	9	5	3	10	12	4	....	...	50	38	....	88	112	12
West Vancouver	1	....	....	....	....	1	....	1	1	....	....	....	....	....	2	2	....	4	4	1
Point Grey	8	....	....	....	....	....	1	4	7	4	3	2	....	....	17	12	....	29	38	1
Richmond	3	1	4	1	4	3	2	3	2	5	1	....	1	....	20	10	....	30	33	....
Unorganized	3	1	....	....	2	3	5	4	3	....	....	....	....	....	17	4	....	21	32	1
Victoria—																				
Victoria City	89	8	12	12	11	40	37	54	61	56	56	35	4	1	279	197	....	476	533	20
Cowichan	3	1	....	....	2	....	3	6	4	5	5	3	....	1	27	6	....	33	36	....
Esquimalt	1	....	1	....	4	4	4	1	...	3	5	2	1	....	18	8	....	26	26	....
Oak Bay	3	....	....	....	....	....	....	....	....	8	2	2	....	....	8	7	....	15	19	1
Saanich ..	9	....	1	1	....	2	1	3	3	7	9	3	....	....	23	16	....	39	40	....
Windermere—																				
Wilmer	....	....	....	....	1	1	1	....	....	1	....	....	....	....	4	....	....	4	5	....
Yale—																				
Yale	2	....	....	....	....	2	...	2	9	....	1	1	....	2	15	3	....	18	12	....
Totals	762	82	107	76	154	329	473	451	456	461	341	158	18	28	2514	1382	....	3896	3887	175

MARRIAGES, 1917.

GROOM AND BRIDE SAME DENOMINATION.

Denomination.	Number of Marriages.
Adventist	4
Agnostic	1
Anglo-Catholic	2
Atheist	1
Baptist	45
Brethern	9
Buddhist	2
Calvinist	1
Cambellite	1
Christian	7
Christian Brethern	6
Christian Baptist	1
Christian Science	4
Christadelphian	1
Church of God	1
Church of England	388
Confucian	5
Congregational	6
International Bible Student	1
Jewish	11
Carried forward	497

Denomination.	Number of Marriages.
Brought forward	497
Latter Day Saints	1
Lutheran	89
Mennonite	1
Methodist	209
None	3
Not given	6
Non-Sectarian	1
Orthodox	1
Orthodox (Greek)	8
Penticostal	1
Presbyterian	366
Protestant	28
Reformed Episcopal	2
Roman Catholic	368
Salvation Army	8
Theist	1
Universalist	1
Total	1,591

GROOM AND BRIDE OF DIFFERENT DENOMINATIONS.

Groom.	Bride.	Number of Marriages.	
Church of England	Baptist	30	
"	Bible Student	1	
"	Brethern	2	
"	Christian	2	
"	Christian Science	1	
"	Congregational	8	
"	Greek Orthodox	1	
"	Jew	2	
"	Lutheran	11	
"	Methodist	68	
"	Mormon	1	
"	New Light	1	
"	None	2	
"	Not given	1	
"	Presbyterian	112	
"	Protestant	5	
"	Roman Catholic	45	
			293
Congregational	Christian Church	2	
"	Christian Science	1	
"	Church of England	8	
"	Methodist	3	
"	Presbyterian	6	
"	Roman Catholic	4	
			24
Greek Catholic	Church of England	3	
"	Presbyterian	2	
"	Roman Catholic	4	
"	Servian Orthodox	1	
			10
Jew	Lutheran	1	
"	Roman Catholic	1	
			2
Not given	Church of England	2	
"	Presbyterian	3	
"	Roman Catholic	2	
"	Theosophist	1	
			8
Presbyterian	Anglo-Catholic	1	
"	Baptist	34	
"	Brethern	4	
"	Christian	2	
"	Christian Science	4	
"	Congregational	6	
"	Church of England	163	
"	Jew	1	
"	Lutheran	12	
Carried forward		227	337

Groom.	Bride.	Number of Marriages.	
Brought forward		227	337
Presbyterian—*Con.*	Methodist	49	
"	None	1	
"	Not given	1	
"	Protestant	3	
"	Roman Catholic	33	
"	Theosophist	1	
"	Universalist	1	
			316
Protestant	Baptist	7	
"	Brethern	1	
"	Church of England	5	
"	Lutheran	1	
"	Methodist	5	
"	Not given	1	
"	Presbyterian	4	
"	Roman Catholic	6	
			30
Reformed Episcopal	Church of England	2	
"	Methodist	1	
			3
Spiritualist	Baptist	1	
"	Church of England	1	
"	Roman Catholic	1	
			3
Lutheran	Adventist	1	
"	Baptist	2	
"	Church of England	22	
"	Disciples of Christ	1	
"	Dutch Reformed	1	
"	Latter Day Saints	1	
"	Methodist	12	
"	Presbyterian	19	
"	Protestant	3	
"	Roman Catholic	13	
			75
Methodist	Adventist	2	
"	Baptist	38	
"	Christian	7	
"	Christian Science	2	
"	Church of England	61	
"	Congregational	2	
"	Evangelican	1	
"	Independent	1	
"	Latter Day Saints	2	
"	Lutheran	7	
Carried forward		123	764

GROOM AND BRIDE OF DIFFERENT DENOMINATIONS—*Concluded.*

Groom.	Bride.	Number of Marriages.	
Brought forward		123	764
Methodist—*Con.*	Jew	1	
"	Not given	1	
"	Presbyterian	79	
"	Protestant	2	
"	Quaker	1	
"	Roman Catholic	23	
			230
None	Church of England	2	
"	Methodist	2	
"	Presbyterian	3	
"	Quaker	1	
"	Roman Catholic	2	
			10
Baptist	Adventist	1	
"	Brethern	1	
"	Christian	1	
"	Christian Science	1	
"	Church of England	16	
"	Congregational	3	
"	Lutheran	2	
"	Methodist	24	
"	Presbyterian	15	
"	Protestant	2	
"	Roman Catholic	13	
"	Salvation Army	1	
			80
Buddhist	Christian	1	
"	Methodist	1	
			2
Christian	Adventist	1	
"	Baptist	2	
"	Church of England	2	
"	Lutheran	2	
"	Methodist	6	
"	Presbyterian	1	
"	Reformed Episcopal	1	
"	Roman Catholic	2	
"	Spiritualist	1	
"	Universalist	1	
			19
Christian Science	Baptist	1	
"	Church of England	2	
"	Congregational	1	
"	Methodist	2	
			6
Carried forward			1,111

Groom.	Bride.	Number of Marriages.	
Brought forward			1,111
Theosophist	Christian Spiritualist	1	
"	Methodist	1	
			2
Unitarian	Church of England	1	
"	Lutheran	1	
"	Methodist	2	
"	Presbyterian	1	
			5
Adventist	Methodist	2	
American Epis. Ch.	Church of England	1	
Anglo-Catholic	Presbyterian	1	
Brahmin	Congregational	1	
Brethern	Church of England	1	
Catholic Apostolic	Church of England	1	
Church of Ireland	Christadelphian	1	
Confucian	Methodist	1	
Dunker	Lutheran	1	
Epis. Ch. of Scotland	Presbyterian	1	
Freethinker	Christian Friends	1	
Liberal	Presbyterian	1	
Materialist	None	1	
Mennonite	Lutheran	1	
Mormon	Presbyterian	1	
Nondescript	Presbyterian	1	
Orthodox	Christian	1	
Quaker	Methodist	1	
Salvation Army	Church of England	1	
Socialist	Methodist	1	
Undenominational	Church of England	1	
Universalist	Methodist	1	
			23
Roman Catholic	Adventist	1	
"	Baptist	10	
"	Christian	2	
"	Church of England	38	
"	Congregational	1	
"	German Evangelical	1	
"	Greek Catholic	1	
"	Inter. Bible Student	1	
"	Lutheran	9	
"	Methodist	23	
"	None	2	
"	Presbyterian	35	
"	Protestant	4	
"	Quaker	1	
			129
Total			1,270
Bridegroom and Bride *same* denomination			1,591
Grand total			2,861

PRELIMINARY TABLES SHOWING BIRTHS FOR DIVISIONS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Ashcroft Group.													
Ashcroft	1	1	..	1	2	4	1	1	1	1	2	..	15
Barkerville	..	..	..	..	..	..	..	..	..	..	..	..	..
Fort George	2	4	5	3	4	4	4	5	4	5	4	6	50
Tete Jaune Cache	..	..	1	..	..	..	1	5	2	4	1	1	15
Clinton	..	..	..	1	2	..	..	..	..	..	2	3	8
Lillooet	..	..	..	..	..	1	2	..	..	..	..	..	3
Quesnel	..	..	4	..	1	1	..	3	2	3	1	3	18
150-Mile House	..	..	..	..	3	..	..	1	..	..	..	..	4
Yale	2	..	2	7	1	1	2	1	1	..	4	1	22
Totals	5	5	12	12	13	11	10	16	10	13	14	14	135
Fairview Group.													
Fairview	..	2	14	5	..	8	10	2	6	4	5	7	63
Greenwood	..	4	3	4	5	6	7	14	4	5	5	3	60
Grand Forks	1	2	7	3	6	5	14	7	1	5	6	4	61
Kamloops	1	14	15	24	11	16	23	20	12	28	21	19	204
Nicola	..	1	2	5	6	4	2	3	7	6	7	6	49
Princeton	..	..	1	4	1	3	4	3	1	2	..	2	21
Vernon	..	20	25	24	25	15	16	36	28	29	41	32	291
Totals	2	43	67	69	54	57	76	85	59	79	85	73	749
Beaton Group.													
Beaton	..	..	1	1	..	..	..	..	..	..	..	..	2
Cranbrook	1	2	8	10	8	5	7	20	14	10	8	11	104
Fernie	7	14	13	14	13	16	14	16	21	16	9	6	159
Golden	..	1	4	5	2	1	1	2	4	6	1	3	30
Kaslo	..	3	4	4	1	1	3	..	..	3	1	..	20
Nakusp	1	..	..	..	1	..	1	1	3	..	..	..	7
Nelson	2	4	8	21	9	15	22	15	9	29	11	17	162
New Denver	..	1	2	1	1	1	3	..	1	2	3	5	20
Revelstoke	1	11	7	9	13	13	11	12	4	6	4	9	100
Rossland	1	3	3	2	4	3	..	4	4	6	7	2	39
Slocan	1	..	4	..	..	1	..	1	..	..	..	..	7
Trail	5	9	15	18	4	6	7	12	11	19	14	14	134
Trout Lake	..	..	..	..	..	..	..	..	..	..	..	..	..
Wilmer	1	..	1	2	2	3	..	5	2	2	..	1	19
Totals	20	48	70	87	58	65	69	88	73	99	58	68	803
Victoria Division.													
Victoria City	16	45	58	62	59	63	102	86	55	59	88	51	744
Cowichan	..	6	4	8	8	7	5	5	8	12	6	3	72
Esquimalt	2	..	8	1	7	3	7	6	9	7	9	2	61
Oak Bay	..	2	3	5	1	5	4	3	1	2	4	3	33
Saanich	3	4	3	10	8	6	12	16	11	7	17	19	116
Totals	21	57	76	86	83	84	130	116	84	87	124	78	1,026
Nanaimo Division.													
Nanaimo City	2	11	26	16	20	18	17	23	20	27	21	19	220
Alert Bay	..	..	..	2	2	..	1	1	..	2	..	1	9
Comox	..	6	9	18	17	11	11	9	5	11	13	15	125
Ladysmith	1	7	5	7	5	5	4	4	3	6	4	5	56
Totals	3	24	40	43	44	34	33	37	28	46	38	40	410
New Westminster Division.													
New Westminster City	6	11	23	28	38	32	24	20	40	43	26	31	322
Burnaby	5	11	9	7	12	13	12	8	15	13	12	8	125
Chilliwack	..	9	3	10	5	8	5	7	8	6	16	19	96
Outside	3	18	18	24	22	32	22	24	20	20	29	22	254
Totals	14	49	53	69	77	85	63	59	83	82	83	80	797
Vancouver Division.													
Vancouver City	44	92	148	146	178	200	185	164	149	294	205	203	2,008
South Vancouver	8	26	36	29	42	38	43	30	30	45	38	25	390
Point Grey	..	1	9	5	9	9	9	10	6	8	8	10	84
North Vancouver City	1	3	13	10	6	12	11	12	5	14	7	12	106
North Vancouver District	..	..	5	2	2	4	3	1	2	4	2	2	27
West Vancouver	..	..	..	..	1	2	1	..	..	2	..	..	6
Richmond	11	8	11	19	10	9	9	11	9	14	13	..	124
Unorganized	1	3	9	8	2	8	7	5	3	..	5	..	51
Totals	65	133	231	219	250	282	268	233	204	381	278	252	2,796

PRELIMINARY TABLES SHOWING BIRTHS FOR DIVISIONS—*Concluded.*

	Jan.	Feb.	Mar.	April.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Alberni Group.													
Alberni	2	..	3	2	4	4	1	1	2	3	1	4	27
Anyox	..	..	..	..	..	..	..	..	..	2	5	..	7
*Atlin	..	..	..	1	..	..	..	..	1	2	2	..	6
Bella Coola	..	..	2	..	..	1	1	3	2	..	3	1	13
Clayoquot	..	..	..	..	..	..	..	..	..	..	..	2	2
Fort Fraser	..	..	..	1	2	..	..	..	..	2	4	..	9
Hazelton	2	2	2	4	4	3	2	3	3	2	5	..	32
*Fort St. John	..	..	..	1	..	..	..	..	..	..	..	..	1
*Hudson Hope	..	..	..	..	..	..	1	1	..	..	..	.	2
Pouce Coupe	..	1	..	..	4	4	2	..	2	..	1	2	16
*Porter's Landing	..	..	..	..	..	1	..	..	..	..	..	..	1
Prince Rupert	2	6	15	14	9	14	7	27	11	14	10	15	144
Quatsino	..	..	1	..	..	..	3	.	..	..	..	..	4
Queen Charlotte	..	..	1	3	..	..	2	1	1	..	5	..	13
Stewart	..	..	..	..	..	..	..	..	.	..	..	..	..
*Telegraph Creek	..	..	..	..	..	1	..	..	..	..	..	..	1
Totals	6	9	24	26	23	28	19	36	22	25	36	24	278
Grand totals	136	368	573	611	602	646	668	670	563	812	716	629	6,994

* No returns received for December.

PRELIMINARY TABLES SHOWING DEATHS FOR DIVISIONS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Victoria Division.													
Victoria	44	41	53	31	40	37	28	41	45	27	37	52	476
Cowichan	1	5	2	4	3	3	2	5	1	3	2	2	33
Esquimalt	3	4	3	1	..	2	4	2	..	2	1	4	26
Oak Bay	3	..	2	1	3	..	..	..	1	1	1	3	15
Saanich	2	4	1	2	5	3	6	3	2	3	6	2	39
Totals	53	54	61	39	51	45	40	51	49	36	47	63	589
Nanaimo Division.													
Nanaimo City	9	10	10	15	9	6	9	9	6	5	4	7	99
Alert Bay	..	2	..	..	1	..	4	..	..	3	..	1	11
Comox	5	9	4	8	7	11	7	7	4	7	9	5	83
Ladysmith	2	3	3	..	2	2	2	2	2	3	1	3	25
Totals	16	24	17	23	19	19	22	18	12	18	14	16	218
Vancouver Division.													
Vancouver City	132	89	140	128	111	116	85	65	95	128	107	111	1,307
South Vancouver	15	9	6	6	3	11	7	5	6	4	5	11	88
Point Grey	2	5	2	..	1	2	..	5	..	6	5	1	29
North Vancouver City	8	5	5	4	7	2	6	6	2	6	1	6	58
North Vancouver District	2	2	2	2	..	1	2	..	1	..	..	..	12
West Vancouver	..	..	1	..	..	1	..	1	..	..	..	1	4
Richmond	2	2	4	2	5	..	..	6	2	..	2	5	30
Vancouver (outside)	1	..	3	1	2	3	4	1	..	1	1	4	21
Totals	162	112	163	143	129	136	104	89	106	145	121	139	1,549
New Westminster Division.													
New Westminster City	25	16	19	31	15	20	15	19	15	22	17	29	243
Burnaby	5	2	1	6	4	4	1	4	1	3	2	2	35
Chilliwack	3	4	3	3	5	..	5	2	1	1	5	5	37
New Westminster (outside)	18	8	19	19	11	21	13	11	15	17	13	15	180
Totals	51	30	42	59	35	45	34	36	32	43	37	51	495
Ashcroft Group.													
Ashcroft	1	..	..	..	..	1	2	..	2	..	4	1	11
Barkerville	..	..	..	..	..	..	..	1	..	..	.	1	2
Fort George	1	2	..	1	2	..	3	2	..	1	..	4	16
Tete Jaune Cache	..	..	..	1	..	..	2	3	1	2	1	..	10
Clinton	..	..	..	..	1	..	..	..	..	..	2	..	3
Lillooet	..	..	..	2	..	2	..	..	..	..	1	..	5
Quesnel	..	..	2	..	1	..	1	..	..	..	..	..	4
150-Mile House	1	2	1	..	..	.	..	..	..	..	..	1	5
Yale	..	1	9	1	1	..	..	1	2	2	1	..	18
Totals	3	5	12	5	5	3	8	7	5	5	9	7	74
Fairview Group.													
Fairview	2	5	3	6	1	3	1	3	1	5	..	1	31
Greenwood	1	3	3	3	2	2	4	..	3	3	1	2	32
Grand Forks	2	6	6	1	1	3	1	4	..	4	2	2	32
Kamloops	29	14	12	14	16	13	9	3	10	17	13	5	155
Nicola	..	6	..	1	3	..	..	3	2	2	..	..	17
Princeton	1	1	3	..	.	..	2	..	1	2	..	2	12
Vernon	7	8	8	8	9	2	11	4	5	11	8	4	85
Totals	42	43	35	38	32	23	28	17	22	44	24	16	364
Beaton Group.													
Beaton	..	..	..	..	..	..	..	..	..	..	..	..	..
Cranbrook	..	..	..	7	3	5	2	3	9	6	6	7	48
Fernie	14	3	14	10	28	6	6	11	12	11	10	15	140
Golden	2	..	1	1	1	4	1	..	..	..	..	..	10
Kaslo	7	2	3	3	1	3	..	..	1	1	2	1	24
Nakusp	1	..	..	..	2	1	..	1	1	..	..	2	8
Nelson	10	14	6	13	9	12	5	8	5	10	8	6	106
New Denver	3	..	..	3	..	1	2	2	..	1	..	1	13
Revelstoke	3	9	5	4	..	3	..	2	..	4	7	3	40
Rossland	3	4	3	3	2	3	1	3	..	3	1	5	31
Slocan City	1	..	..	..	1	..	..	..	..	..	1	1	4
Trail	5	..	2	2	4	1	3	2	4	6	4	..	33
Trout Lake	..	..	..	..	..	..	2	..	..	..	..	..	2
Wilmer	1	1	..	..	..	1	1	..	..	..	..	..	4
Totals	50	33	34	46	51	40	23	32	32	42	39	41	463

PRELIMINARY TABLES SHOWING DEATHS FOR DIVISIONS—*Concluded.*

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Alberni Group.													
Alberni	3	2	..	..	2	3	1	1	1	2	..	1	16
*Atlin	..	..	1	..	..	..	..	..	..	..	..	..	1
Bella Coola	1	1	..	..	..	..	4	1	2	1	..	1	11
Clayoquot	..	..	..	1	..	..	..	..	..	..	..	..	1
Fort Fraser	..	1	1	1	2	..	..	1	1	2	..	..	9
Hazelton	4	2	2	2	..	..	2	3	2	3	1	4	25
*Fort St. John	..	..	..	..	..	..	..	..	..	..	..	..	..
*Hudson Hope	..	..	..	..	..	..	..	..	..	..	..	..	..
Pouce Coupe	..	..	..	..	1	1	1	..	..	..	..	..	3
*Porter's Landing	..	..	..	..	..	..	..	..	..	..	..	..	..
Prince Rupert	5	7	5	4	7	6	6	3	8	5	2	5	63
Anyox	..	..	..	..	..	..	..	..	..	..	1	..	1
Quatsino	..	..	..	..	..	..	..	..	2	..	..	..	2
Queen Charlotte	..	..	2	..	..	..	..	..	..	1	..	2	5
Stewart	..	..	1	..	..	..	..	..	..	2	..	..	3
*Telegraph Creek	..	1	..	..	..	1	2	..	..	..	..	..	4
Totals	13	14	12	8	12	11	16	9	16	16	4	13	144
Grand totals	390	315	376	361	334	322	275	259	274	349	295	346	3,896

*No returns received for December.

MARRIAGES, 1917.

Number of Marriages.

Victoria Division—		
Victoria City	382	
Cowichan	16	
Esquimalt	19	
Oak Bay	14	
Saanich	18	
		449
Nanaimo Division—		
Nanaimo	63	
Alert Bay	6	
Comox	28	
Ladysmith	15	
		112
Vancouver Division—		
Vancouver City	1,191	
South Vancouver	97	
Point Grey	58	
North Vancouver City	38	
North Vancouver District	3	
West Vancouver	3	
Richmond	4	
Vancouver (outside)	..	
		1,394
New Westminster Division—		
New Westminster City	164	
Burnaby	34	
Chilliwack	20	
New Westminster (outside)	61	
		279
Ashcroft Group—		
Ashcroft	8	
Barkerville	2	
Fort George	16	
Tete Jaune Cache	1	
Clinton	2	
Lillooet	3	
Quesnel	6	
150-Mile House	3	
Yale	3	
		44
Fairview Group—		
Fairview	26	
Greenwood	15	
Carried forward	41	2,278

Brought forward	41	2,278
Fairview Group—*Concluded.*		
Grand Forks	16	
Kamloops	66	
Nicola	15	
Princeton	6	
Vernon	74	
		218
Alberni Group—		
Alberni	8	
Atlin	5	
Bella Coola	3	
Clayoquot	..	
Fort Fraser	7	
Hazelton	12	
Fort St. John	..	
Hudson Hope	..	
Pouce Coupe	4	
Porter's Landing	..	
Prince Rupert	61	
Anyox	1	
Quatsino	1	
Queen Charlotte	4	
Stewart	..	
Telegraph Creek	1	
		107
Beaton Group—		
Beaton	..	
Cranbrook	32	
Fernie	40	
Golden	10	
Kaslo	6	
Nakusp	5	
Nelson	83	
New Denver	7	
Revelstoke	30	
Rossland	17	
Slocan City	3	
Trail	23	
Trout Lake	..	
Wilmer	2	
		258
Total		2,861

Bridegroom and Bride born in same Country.

Austria	9
Canada	562
China	4
Denmark	1
England	238
Finland	12
France	2
Galicia	3
Germany	5
Greece	2
Holland	1
Hungary	1
Ireland	15
Italy	24
Japan	11
Carried forward	890

Brought forward	890
Newfoundland	1
New Zealand	2
Norway	8
Poland	2
Roumania	1
Russia	6
Scotland	89
Servia	1
Sweden	25
United States of America	296
Wales	1
Not given	2
Total	1,324

MARRIAGES, 1917—*Continued.*

BRIDEGROOM AND BRIDE BORN IN DIFFERENT COUNTRIES.

Place of Birth.		Number of Marriages.
Groom.	Bride.	
England	Argentina	1
"	Australia	6
"	Bohemia	1
"	Canada	173
"	Channel Islands	1
"	China	1
"	Denmark	2
"	Egypt	1
"	France	1
"	Germany	3
"	Ireland	22
"	Mexico	1
"	Newfoundland	3
"	Norway	1
"	Poland	1
"	Portugal	1
"	Russia	3
"	Scotland	66
"	South Africa	1
"	Sweden	4
"	Switzerland	1
"	Tasmania	1
"	United States of America	52
"	Wales	7
"	Not given	2
Total		356
Australia	Canada	9
"	England	5
"	United States of America	5
British West Indies	Canada	4
"	England	1
"	Scotland	2
Barbadoes	Canada	1
Ceylon	"	1
Channel Islands	"	2
East Indies	United States of America	1
Total		31
Scotland	Alaska	1
"	Australia	1
"	Canada	65
"	Channel Islands	1
"	England	53
"	Ireland	8
"	New Zealand	2
"	South Africa	1
"	Switzerland	1
"	United States of America	16
"	Wales	2
Total		151
Ireland	Canada	29
"	England	18
"	Isle of Man	1
"	Scotland	6
"	South Australia	1
"	United States of America	6
Total		61
Wales	Canada	9
"	England	6
"	Ireland	1
"	Norway	1
"	Scotland	2
"	United States of America	3
Total		22
Gibraltar	England	1
Isle of Man	Canada	1
India	"	1
"	United States of America	2
Total		5
Canada	Australia	2
"	Austria	2
"	Belgium	1
"	Channel Islands	1
"	China	1
"	Denmark	2
"	England	126
"	Finland	2
"	France	6
"	Germany	1
"	Iceland	2
"	Ireland	16
"	Italy	1
"	Newfoundland	2
"	New Zealand	1
"	Norway	1
"	Russia	2
"	Scotland	76
"	South Africa	1
"	Sweden	5
"	Syria	1
"	United States of America	152
"	Wales	8
"	Not given	1
Total		413
Russia	Austria	1
"	Canada	2
"	Denmark	1
"	United States of America	3
"	Wales	1
Total		8
United States of America	Australia	3
"	Canada	198
"	England	68
"	Finland	1
"	France	4
"	Germany	2
"	Iceland	6
"	Ireland	3
"	Italy	1
"	Japan	1
"	Norway	3
"	Poland	1
"	Russia	3
"	Scotland	19
"	Servia	1
"	South Africa	1
"	Sweden	6
Total		321
Sweden	Canada	11
"	Denmark	1
"	England	4
"	Finland	1
"	Holland	1
"	Iceland	1
"	Ireland	1
"	Norway	1
"	Russian Poland	1
"	Scotland	2
"	United States of America	15
Total		39

MARRIAGES, 1917—*Concluded.*

BRIDEGROOM AND BRIDE BORN IN DIFFERENT COUNTRIES—*Concluded.*

PLACE OF BIRTH.		Number of Marriages.
Groom.	Bride.	
Newfoundland	Canada	3
"	United States of America	2
"	Wales	1
Total		6
New Zealand	Canada	4
"	England	2
"	United States of America	2
Total		8
South Africa	Canada	2
"	England	1
"	New Zealand	1
"	United States of America	1
Total		5
Straits Settlements	England	1
Austria	Canada	2
"	England	1
"	France	1
"	Hungary	1
"	United States of America	3
Total		8
China	Canada	6
"	United States of America	1
Total		7
Denmark	Canada	4
"	England	1
"	Germany	1
"	Ireland	1
Total		7

PLACE OF BIRTH.		Number of Marriages.
Groom.	Bride.	
France	Canada	5
"	England	2
"	Mauritius	1
"	Switzerland	1
"	United States of America	2
Total		11
Germany	Canada	2
"	England	1
"	Switzerland	1
"	United States of America	2
"	Wales	1
Total		7
Hungary	Canada	1
Italy	Argentine	1
"	Austria	1
"	Canada	14
"	England	5
"	Mexico	1
"	Russia	1
"	Scotland	1
"	United States of America	5
Total		29
Norway	Canada	14
"	England	9
"	Germany	1
"	Iceland	1
"	Ireland	1
"	Scotland	1
"	Sweden	5
"	United States of America	8
Total		40

NOTE.—Grand total, 2,861.

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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—VICTORIA CITY.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
8	Whooping-cough	....	....	1	....	....	....	....	....
9	Diphtheria and croup	....	....	....	....	2	....	....	1
10	Influenza	....	....	....	1	....	....	....	....
14	Dysentry	....	2	1	....	....	....	....	....
18	Erysipelas	....	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	1	....	1	1	....	....
28A	Tubercular laryngitis	....	....	....	....	....	....	....	....
29	Acute miliary tuberculosis	....	....	....	....	....	....	....	....
30	Tubercular meningitis	....	....	1	....	....	....	....	1
30A	Tubercular peritonitis	....	....	....	....	....	....	....	....
34	Tuberculosis of other organs	....	....	....	....	....	....	....	....
34A	Tuberculosis of mesenteric glands	....	....	....	....	....	....	....	....
37	Syphilis	....	....	....	....	....	....	....	....
39A	Cancer of retroperitoneal glands	....	....	....	....	....	....	....	....
39B	Cancer of maxilla and throat	....	....	....	....	....	....	....	....
39C	Cancer of omentum	....	....	....	....	....	....	....	....
39D	Cancer of orbit	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
43	Cancer and other malignant tumours of the breast	....	....	....	....	....	....	....	....
44A	Cancer of eye and head	....	....	....	....	....	....	....	....
44B	Cancer of pancreas	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
45A	Cancer of bladder	....	....	....	....	....	....	....	....
45B	Abscess of liver	....	....	....	....	....	....	....	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	....	1	....	....
47	Acute articular rheumatism	....	....	....	....	....	....	....	....
48	Chronic rheumatism and gout	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	1	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
51	Exophthalmic goitre	....	....	....	....	....	....	....	....
52	Addison's disease	....	....	....	....	....	....	....	....
54A	Anæmia pernicious	....	....	....	....	....	....	....	....
55A	Purpura hæmorrhagica	....	1	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
	II.—DISEASES OF THE NERVOUS SYSTEM.								
61	Meningitis	1	....	....	....	....	....	....	1
61A	Acute cerebro-spinal meningitis	....	....	....	....	....	....	....	1
61B	Influenzal meningitis	....	....	....	....	....	....	....	1
63	Other diseases of the spinal cord	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	1	....	....	....	....	....	....	....
66	Paralysis without specified cause	1	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
69	Epilepsy	....	....	....	....	....	....	....	....
71	Convulsions of infants	3	....	....	....	1	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77	Pericarditis	....	1	....	....	....	....	....	....
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	1
79	Organic diseases of the heart	....	....	....	....	....	....	1	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Fatty degeneration of heart	....	....	....	....	....	....	....	....
79C	Mitral regurgitation	....	....	....	....	....	....	....	....
79D	Cardiac asthma	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
82	Embolism and thrombosis	....	....	....	....	....	....	....	....

DEATH, 1917.

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—VICTORIA CITY.—*Continued.*	M.	F.	M.	F.	M.	F.	M.	F.
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	....	2	....	....	....	....	....	....
90	Chronic bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	5	....	1	....	....	....	....	....
92	Pneumonia	2	2	....	....	....	....	....	....
92A	Lobar pneumonia	....	1	....	....	....	....	....	....
92B	Pneumonia following operation	....	....	....	....	....	....	....	....
92C	Pneumonia following measles	2	....	....	....	....	....	1	....
92D	Pneumonia following whooping-cough	1	1	....	....	....	....	....	....
92E	Pneumonia hypostatic	....	....	....	....	....	....	....	....
92F	Pneumonia terminal	....	....	....	....	....	....	....	....
92G	Pneumonia following pertussis	....	1	....	....	....	....	....	....
93	Pleurisy	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
96	Asthma	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
103	Other diseases of the stomach (cancer excepted)	....	....	....	....	....	....	....	....
103A	Ulcer of pharynx	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	1	2	....	1	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	2	1	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	1	....
109	Hernias	....	....	....	....	....	....	....	....
109A	Intestinal obstructions	1	....	....	....	....	....	....	....
111	Acute yellow atrophy of the liver	....	....	....	....	....	....	....	....
116	Diseases of the spleen	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
117A	Peritonitis-appendicitis	....	....	....	....	....	....	....	....
118	Other diseases of the digestive system (cancer and tuberculosis excepted)	....	....	....	....	....	....	....	....
118A	Cholemia	....	....	....	....	....	....	....	....
118B	Pancreatitis	....	....	....	....	....	....	....	....
118C	Ileocolitis	....	1	1	....	....	1	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	1	....	....
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
122	Other diseases of the kidneys and annexa	....	....	....	....	....	....	....	....
123	Calculi of the urinary passages	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
129	Uterine tumour (non-cancerous)	....	....	....	....	....	....	....	....
130	Diseases of the uterus	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
135	Puerperal hæmorrhage	....	....	....	....	....	....	....	....
137A	Induced abortion	....	....	....	....	....	....	....	....
137B	Eclampsia	....	....	....	....	....	....	....	....
138	Puerperal albuminuria and convulsions	....	....	....	....	....	....	....	....
141A	Peritonitis following childbirth	....	....	....	....	....	....	....	....
141B	Pelvic cellulitis following cellulitis	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
	IX.—DISEASES OF THE BONES AND ORGANS OF LOCOMOTION.								
146	Diseases of the bones (tuberculosis excepted)	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	8	4	....	....	....	....	1	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	5	4	....	....	....	....	....	....
151A	Accident of labour	1	....	....	....	....	....	....	....
152	Other diseases peculiar to early infancy	1	1	....	....	....	....	....	....
153A	Still-born	12	8	....	....	....	....	....	....
153B	Premature	7	4	....	....	....	....	....	....
153C	Toxemia from jaundice neonatorum	1	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—VICTORIA CITY.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
155	Suicide by poison	....	....	....	....	....	....	....	....
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
159	Suicide by firearms	....	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	....	....	....	1	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
172	Traumatism by fall	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	1	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
175A	Traumatism in shipyard	....	....	....	....	....	....	....	....
185	Fractures (causes not specified)	....	....	....	....	....	....	....	....
186	Other external violence	....	1	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187	Ill-defined organic disease	....	....	....	....	....	....	....	....
187A	Dropsy	....	....	....	....	....	....	....	....
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		53	36	6	2	7	5	6	6
	VICTORIA DIVISION—COWICHAN.								
	I.—GENERAL DISEASES.								
20	Purulent infection and septicæmia	....	....	..	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
32A	Tuberculosis of spine	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
45A	Cancer of prostate	....	....	....	....	....	....	....	....
45B	Cancer of bronchial glands	....	....	....	....	....	....	....	....
51	Exophthalmic goitre	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
79A	Mitral regurgitation	....	....	....	....	....	....	....	....
79B	Mitral regurgitation complicated by nephritis	....	....	....	....	....	....	....	....
81A	Aneurism	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	1	....	....	....	....	....
93	Pleurisy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
152A	Atelectasis	1	....	....	....	....	....	....	....
153A	Premature	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—COWICHAN.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
172	Traumatism by fall	....	....	....	....	....	....	....	....
		3	....	1	....	....	....	....	....
	VICTORIA DIVISION—ESQUIMALT.								
	I.—GENERAL DISEASES.								
14	Dysentry	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
34	Tuberculosis of other organs	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
81A	Arterio sclerosis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
90	Chronic bronchitis	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	1	....	....
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
145	Other diseases of the skin and annexa	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
		1	....	....	....	....	1	....	....
	VICTORIA DIVISION—OAK BAY.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
44A	Cancer of the jaw	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78	Acute endocarditis	....	....	....	....	....	....	....	....
81A	Aneurism	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—OAK BAY.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
96	Asthma	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Still-born	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
		2	1	....	....	....	....	....	....
	VICTORIA DIVISION—SAANICH.								
	I.—GENERAL DISEASES.								
8	Whooping-cough	....	1	....	....	....	....	....	....
24	Tetanus, neonatorum	....	1	....	....	....	....	....	....
39A	Cancer of neck	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Mitral regurgitation	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
84A	Hodgkin's disease	....	....	....	....	....	....	....	....
85	Hæmorrhage	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
90	Chronic bronchitis	....	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	1	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	....	....	....	....	....	1	....	....
113	Cirrhosis of the liver	1	....	....	....	....	....	....	....
115	Other diseases of the liver	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	1	....	....	....	....	....	....
151B	Non-assimilation of food	1	1	....	....	....	....	....	....
153A	Premature	1	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VICTORIA DIVISION—SAANICH—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		4	5	....	....	....	1	1	....
	NEW WESTMINSTER DIVISION—NEW WESTMINSTER CITY.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
9	Diphtheria and croup	....	....	....	....	....	....	1	....
20	Purulent infection and septicæmia	....	....	....	....	2	....	....	....
20A	Streptococcic septicæmia	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	1	....
30	Tubercular meningitis	....	....	....	1	....	....	1	....
30A	Tubercular peritonitis	....	....	....	....	....	....	....	....
34A	Cerebral tuberculosis	....	....	....	....	....	....	....	....
37	Syphilis	....	....	....	....	....	....	....	....
39A	Cancer of tongue	....	....	....	....	....	....	....	....
39B	Cancer of Æsophagus	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
43	Cancer and other malignant tumours of the breast	....	....	....	....	....	....	....	....
44	Cancer and other malignant tumours of the skin	....	....	....	....	....	....	....	....
44A	Cancer of face	....	....	....	....	....	....	....	....
50A	Diabetic furunculosis	....	....	....	....	....	....	....	....
54A	Anæmia pernicious	....	....	....	....	....	....	....	....
55A	Purpura hæmorrhagica	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
63A	Acute anterior poliomyelitis	....	....	....	....	....	1	....	....
63B	Acute transverse myelitis	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	1	1	....	....	....	....	....	....
67	General paralysis of the insane	....	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
68A	Cretinism	....	....	....	....	....	....	1	....
69	Epilepsy	....	....	....	1	....	....	....	....
71	Convulsions of infants	1	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Fatty degeneration of heart	....	....	....	....	....	....	....	....
79C	Mitral regurgitation	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
81A	Arteriosclerosis	....	....	....	....	....	....	....	....
82	Embolism and thrombosis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	1	....	....	....	....	....	....	....
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	1	....	....	....
92A	Suffocation (insufflation)	....	....	....	....	....	....	....	....
92B	Hypostatic pneumonia	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
96	Asthma	....	....	....	....	....	....	....	....
97A	Pulmonary embolism	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Certification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NEW WESTMINSTER DIVISION—NEW WESTMINSTER CITY.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
103	Other diseases of the stomach (cancer excepted)	....	1	....	....	....	....	....	....
103A	Hemorrhage of bowels	1	....	....	....	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
108A	Appendicitis (gangrenous)	....	....	....	....	....	....	....	1
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
110A	Ileocolitis	1	1	....	....	....	....	....	....
110B	Intussusception	....	....	....	....	1	....	....	....
110C	Abscess of the liver	....	....	....	....	....	....	....	....
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
118	Other diseases of the digestive system (cancer and tuberculosis excepted)	....	....	1	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
122	Other diseases of the kidneys and annexa	....	....	1	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
131A	Pyonephrosis	....	....	....	....	....	....	....	....
132	Salpingitis and other diseases of the female genital organs	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
137A	Induced abortion	....	....	....	....	....	....	....	....
140	Following childbirth (not otherwise defined)	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
145	Other diseases of the skin and annexa	1	....	....	....	....	....	....	....
	IX.—DISEASES OF THE BONES AND ORGANS OF LOCOMOTION.								
149A	Toxic Absorption (osteomyelitis)	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	....	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
151B	Non-assimilation of food	4	2	....	....	....	....	....	....
153A	Still-born	7	11	....	....	....	....	....	....
153B	Premature	4	3	....	....	....	....	....	....
153C	Hæmophilia neonatorum	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
159	Suicide by firearms	....	....	....	....	....	....	....	....
165	Other acute poisonings	....	....	....	....	1	....	....	....
169	Accidental drowning	....	..	....	....	....	1	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	....	....
185	Fractures (causes not specified)	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
		24	20	2	2	5	2	4	1

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NEW WESTMINSTER DIVISION—BURNABY.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
5	Smallpox	....	....	....	....	....	....	....	....
27	Beriberi	....	....	....	....	....	....	....	....
32A	Tuberculosis of spine	..	....	....	....	....	....	....	....
39A	Cancer of jaw	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
71	Convulsions of infants	1	....	1	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Mitral regurgitation	....	....	....	....	....	....	....	....
79C	Failure of compensation	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	....	1	....	....	....	....	....
92A	Lobar pneumonia	....	1	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	1	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	1	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	2	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	1	....	....	....	....	....	....	....
153A	Still-born	1	....	....	....	....	....	....	....
153B	Premature	2	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	1	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		9	1	2	....	....	....	1	....
	NEW WESTMINSTER DIVISION—CHILLIWACK.								
	I.—GENERAL DISEASES.								
17	Leprosy	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
51	Exophthalmic goitre	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
71	Convulsions of infants	....	....	1	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	1	1	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NEW WESTMINSTER DIVISION—CHILLIWACK.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	1	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
97A	Empyema	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
103A	Other diseases of the stomach (hæmorrhage)	....	1	....	....	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	1	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
153A	Premature	1	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
175A	Traumatism not specified	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
		5	5	1	....	....	....	....	....
	NEW WESTMINSTER DIVISION—OUTSIDE.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	1	....	....	....	....	....
10	Influenza	....	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	1	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
30A	Tubercular peritonitis	....	....	1	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
45A	Cancer of prostate	....	....	....	....	....	....	....	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
67	General paralysis of the insane	....	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
69	Epilepsy	....	....	1	....	....	....	....	....
71	Convulsions of infants	1	1	....	....	....	....	....	....
71A	Convulsions following measles	1	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	1	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	1	....	....	....	....	....	....	....
79A	Cardiac paralysis	....	....	....	....	....	....	....	....
79B	Chronic valvular disease	....	....	....	....	....	....	....	....
79C	Dilatation of heart	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
81A	Arteriosclerosis	....	....	....	....	....	....	....	....
85A	Rupture of femoral vein	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
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	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	....	....	1	....	....	....	....	....
91	Bronchopneumonia	....	3	1	....	....	....	....	....
92	Pneumonia	1	1	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
92B	Bronchopneumonia following whooping-cough	....	1	....	....	....	....	....	....
92C	Hypostatic pneumonia	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	1
97A	Pulmonary embolism	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....
98B	Suppurative tonsilitis	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
103	Other diseases of the stomach (cancer excepted)	1	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	....	....	1	1	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	....	....
106	Ankylostomiasis	....	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	1	....	....	....	....	....	....	....
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
110A	Enterocolitis	....	1	....	....	1	....	....	....
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
118	Other diseases of the digestive system (cancer and tuberculosis excepted)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	1	....
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
139	Puerperal phlegmasia alba dolens, embolus, sudden death	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	3	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	1	....	....	....	....	....	....
151A	Accident of labour	....	1	....	....	....	....	....	....
152A	Atelectasis	1	....	....	....	....	....	....	....
153A	Still-born	3	3	....	....	....	....	....	....
153B	Premature	1	4	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	1	1	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
185	Fractures (causes not specified)	....	....	....	....	....	....	....	....
186	Other external violence	1	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187A	Dropsy	....	....	....	....	....	....	....	....
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		17	16	6	1	2	2	1	1

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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								1						1						3	1		4
				1																1			1
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									1			1								1			2
						1	1			1				1	1					4	2		6
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3	2	6	2	18	5	15	3	16	3	20	5	20	5	6	5					130	50		180

CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NANAIMO DIVISION—NANAIMO CITY.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	1	....	....
8	Whooping-cough	....	1	....	....	....	1	....	....
9	Diphtheria and croup	....	....	....	....	....	1	1	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
39A	Cancer of the hand	....	....	....	....	....	....	....	....
39B	Cancer of the lip	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
47	Acute articular rheumatism	....	....	....	....	....	1	....	....
50	Diabetes	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
54A	Anæmia pernicious	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	....	....	....	....	1	....	....
61A	Abscess of brain	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
71	Convulsions of infants	1	1	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
81A	Atheroma	....	....	....	....	....	....	....	....
81B	Ludwig's angina	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
87	Diseases of the larynx	....	....	....	....	....	....	....	....
89	Acute bronchitis	....	1	....	....	....	....	....	....
90	Chronic bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	1	1	....	....	....	2	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	1	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
114	Biliary calculi	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
141A	Ectopic pregnancy	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	2	1	....	....	....	....	....	....
152A	Atelectasis	1	....	....	....	....	....	....	....
153A	Premature	3	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
182A	Opium poisoning	....	....	....	....	....	....	....	....
186	Other external violence	....	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NANAIMO DIVISION—NANAIMO CITY.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		10	7	....	....	....	6	1	....
	NANAIMO DIVISION—ALERT BAY.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	1	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
79A	Cardiac paralysis	....	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Still-born	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
158	Suicide by drowning	....	....	....	....	....	....	....	....
164	Poisoning by food	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	1	....	....	....	....	....	....	....
		2	2	....	....	....	....	....	....
	NANAIMO DIVISION—COMOX.								
	I.—GENERAL DISEASES.								
8	Whooping-cough	1	1	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	1	....	....	1
34	Tuberculosis of other organs	....	....	....	....	....	....	....	....
37A	Syphilis, congenital	1	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
45A	Cancer of bladder	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	....	....	....	....	....	....	....
65	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
69	Epilepsy	....	....	....	....	....	....	....	....
71	Convulsions of infants	....	....	1	....	....	....	....	....
73	Neuralgia and neuritis	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Cardiac paralysis	....	....	....	....	....	....	....	....
79B	Mitral regurgitation	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	....	....	....	....	1	....	....	....
91	Bronchopneumonia	....	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under one year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NANAIMO DIVISION—COMOX.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137A	Uremia of pregnancy	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	....	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
160	Suicide by cutting or piercing instruments	....	....	....	....	....	....	....	....
165	Other acute poisonings	....	....	....	....	....	....	....	....
168	Absorption of deleterious gases (conflagration excepted)	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
181	Electricity (lightning excepted)	....	....	....	....	....	....	....	....
182	Homicide by firearms	....	....	....	....	....	....	....	....
185	Fractures (causes not specified)	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		2	2	1	....	2	....	....	1
	NANAIMO DIVISION—LADYSMITH.								
	I.—GENERAL DISEASES.								
9	Diphtheria and croup	....	....	....	....	....	1	....	....
28	Tuberculosis of the lungs	....	....	....	....	1	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
70	Convulsions (non-puerperal)	....	....	1	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	1	2	....	....	....	1	....	....
92	Pneumonia	....	2	....	....	....	....	....	....
93	Pleurisy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	1	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F'	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NANAIMO DIVISION—LADYSMITH.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	...
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
145A	Gangrene (diabetic)	....	...	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	....	1	....	...	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	....	1	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	...	....	....
186A	Swallowing lye	....	....	....	....	1	....	....	....
		1	6	1	1	2	2	....	....
	BEATON GROUP—CRANBROOK.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	...
20	Purulent infection and septicæmia	....	....	....	...	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
30	Tubercular meningitis	....	1	....	....	....	1	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	...	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	....	....	....	....
52	Addison's disease	....	....	....	....	....	....	....	...
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
62	Locomotor ataxia	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
68A	Paralysis from bite of wood tick	....	....	....	....	....	....	....	1
70	Convulsions (non-puerperal)	....	....	....	....	1	....	....	....
71	Convulsions of infants	....	1	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
81	Diseases of the arteries	...	....	....	....	....	....	...	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	....	....	2	....	....	....	....
92	Pneumonia	1	1	....	....	....	....	....	....
96	Asthma	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	2	1	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	...
118	Other diseases of the digestive system (cancer and tuberculosis excepted)	....	....	....	....	....	1	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Still-born	2	1	....	....	....	....	....	....
153B	Premature	1	3	....	....	....	....	....	....
153C	Injury by forceps at birth	1	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—CRANBROOK.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
173A	Traumatism by railway-construction	....	....	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	....	....
		8	8	....	2	1	2	....	1
	BEATON GROUP—FERNIE.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	1	....	....	....
6	Measles	....	1	....	....	....	....	....	....
8	Whooping-cough	3	1	1	1	....	....	....	....
20	Purulent infection and septicæmia	1	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
54A	Anæmia pernicious	....	1	....	....	....	....	....	....
56A	Alcoholism, chronic	....	....	....	....	....	....	....	....
56B	Alcoholic poisoning	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	1	1	....	....	....	....	....	....
70	Convulsions (non-puerperal)	....	....	....	....	....	....	....	....
71	Convulsions of infants	2	2	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	1	....	....	....	....	....	....	....
90	Chronic bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	1	1	....	1	....	....	....	....
92	Pneumonia	....	....	1	1	....	....	....	1
92A	Bronchopneumonia following measles	....	....	1	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	4	4	....	....	1	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
110A	Enterocolitis	1	....	....	....	....	....	....	....
110B	Ileocolitis	1	1	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
131	Cysts and other tumours of the ovary	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	2	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—FERNIE.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	...	...	....	....	....	....	....
151B	Non-assimilation of food	....	1	....	....	....	....	....	....
153A	Still-born	3	5	....	....	....	....	....	....
153B	Premature	3	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	...	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	....	....	....	....	1	....	....
169	Accidental drowning	....	....	....	1	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	...	....	....	....	....	....	....	....
182A	Traumatism (coasting)	....	....	....	....	....	....	....	....
186	Other external violence	....	....	.	....	....	....	....	....
		24	18	3	4	2	1	....	1
	BEATON GROUP—GOLDEN.								
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92A	Lobar pneumonia	....	....	....	...	....	....	...	....
97A	Pulmonary embolism	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	1	....	....	...	...	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	..	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
		1	...	....	....	....	...	....	....
	BEATON GROUP—KASLO.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
56A	Alcoholism, chronic	....	....	....	....	....	...	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79A	Mitral regurgitation	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	..	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—KASLO.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	....	1	....	....	....	....	....	....
153A	Still-born	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	1	....
175B	Traumatism by snowslide	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
		1	1	....	....	....	....	1	....
	BEATON GROUP—NAKUSP.								
	I.—GENERAL DISEASES.								
34A	Tuberculosis of glands	....	....	....	....	....	....	....	....
44A	Cancer of brain	....	....	....	....	....	....	....	....
50A	Congenital goitre	....	1	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	1	....	....	....	....	....	....	....
		1	1	....	....	....	....	....	....
	BEATON GROUP—NELSON.								
	I.—GENERAL DISEASES.								
7	Scarlet fever followed by nephritis	....	....	....	....	....	....	....	....
8	Whooping-cough	....	2	....	....	....	....	....	....
24A	Typhoid fever followed by general peritonitis	....	....	....	....	....	....	....	....
24B	Measles followed by bronchopneumonia	....	....	....	....	1	....	....	....
28	Tuberculosis of the lungs	....	....	1	....	....	....	....	....
30	Tuberculous meningitis	1	....	....	....	1	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
52	Addison's disease	....	....	....	....	....	....	....	....
54A	Anæmia pernicious	....	....	....	....	....	....	....	....
56A	Alcoholism, chronic	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61A	Cerebrospinal meningitis	....	....	....	....	1	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
69	Epilepsy	....	....	....	....	....	....	....	....
71	Convulsions of infants	....	1	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	1	....	....	....	....	....	....
79B	Mitral regurgitation complicated by nephritis	....	....	....	....	....	....	....	....
82	Embolism and thrombosis	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—NELSON.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	2	....	....	....	....	....	....	....
91	Bronchopneumonia	....	....	....	....	....	....	....	1
92	Pneumonia	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
97A	Asthma (bronchial)	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
103	Other diseases of the stomach (cancer excepted)	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	....	1	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	1	....	1
110A	Gangrenous appendicitis followed by general peritonitis	....	....	....	....	....	....	....	....
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	1
	VII.—THE PUERPERAL STATE.								
137A	Induced abortion	1	....	....	....	....	....	....	....
140	Following childbirth (not otherwise defined)	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	1	....	....	....	....	....	....
153A	Still-born	3	1	....	....	....	....	....	....
153B	Premature	....	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
160	Suicide by cutting or piercing instruments	....	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	....	....	....	1	1	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187A	Dropsy	....	....	....	....	....	....	....	....
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		9	8	1	....	4	2	....	3
	BEATON GROUP—NEW DENVER.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
29	Acute miliary tuberculosis	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61A	Cerebral meningitis	....	....	....	....	....	1	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—NEW DENVER.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	V.—DISEALBS OF THE DEGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	1	....	...	....	....	....	....	....
	THE PUERPERAL STATE.								
137A	Uremia of pregnancy	....	....	....	....	....	...	....	..
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	...	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
		1	....	....	....	....	1	....	....
	BEATON GROUP—REVELSTOKE.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	....	....	..	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	...	....	....	....	....	...	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61A	Meningitis induced by external violence	....	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
71	Convulsions of infants	....	2	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	...	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	1	....	....	....	..	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	1	....	....	....	...	....	....	....
92A	Pneumonia following whooping-cough	....	....	....	....	...	1	....	....
92B	Hypostatic pneumonia	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	1	....	....	....	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	1	....
110A	Intussusception	1	....	....	....	....	....	....	...
110B	Gastroenteritis followed by miningitis	....	...	....	....	1	....	....	....
118A	Jaundice	1	...	...	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	..	....	....	....	....	....	....	....
120A	Uremia	....	....	...	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	...	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	2	....	....	....	....	....	...	....
153A	Premature	2	1	....	....	...	....	....	....
153B	Infection of cord	1	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—REVELSTOKE—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	1	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	...	...	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
186A	Explosion at powder-house	...	....	...	....	....	....	....	....
		11	3	....	....	1	2	1	.
	BEATON GROUP—ROSSLAND.								
	I.—GENERAL DISEASES.								
20	Purulent infection and septicæmia	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	...
30	Tuberculous meningitis	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61A	Cerebral tumor	....	....	....	....	....	....	....	....
62	Locomotor ataxia	....	....	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	...
79A	Mitral regurgitation	....	....	....	....	....	....	....	....
78B	Dilatation of heart	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Capillary bronchitis	1	....	....	....	....	....	....	...
93	Pleurisy	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
110A	Enterocolitis	..	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
122	Other diseases of the kidneys and annexa	....	....	....	....	...	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	....	1	....	....	....	....	...	....
153A	Still-born	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187	Ill-defined organic disease	....	....	....	....	....	....	....	....
		3	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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						1														1			1
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—SLOCAN CITY.	M.	F.	M.	F.	M.	F.	M.	F.
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	..	...	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	....	...	....	....	1	....	....
	IV.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	1	....	....	....	....	....	....	....
		1	....	....	....	....	1	....	....
	BEATON GROUP—TRAIL.								
	I.—GENERAL DISEASES.								
8	Whooping-cough followed by nephritis and convulsions	....	....	....	...	1	....	....	....
20	Purulent infection and septicæmia	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	...	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
71	Convulsions of infants	1	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	.	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	....	2	....	....	....	....	....	....
92	Pneumonia	1	....	....	....	....	....	....	..
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	1	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
141A	Puerperal embolism	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	1	....	....	...	....	....	....	....
153A	Still-born	1	1	....	....	....	....	....	....
153B	Premature	....	1	....	....	....	....	..	....
153C	Difficult parturition	...	1	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	1	....	...	....
169A	Traumatism in logging camp and saw-mill	....	....	....	....	....	....	....	...
173	Traumatism in mines and quarries	....	....	...	....	....	....	....	....
181	Electricity (lightning excepted)	....	....	..	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	1	....
		5	5	....	....	2	....	1	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—TROUT LAKE.	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
163	Other suicides	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	BEATON GROUP—WILMER.								
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Failure of compensation	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
96	Asthma	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	ALBERNI GROUP—ALBERNI.								
	I.—GENERAL DISEASES.								
9	Diphtheria and croup	....	....	....	....	....	....	....	....
39A	Cancer of the bladder	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Fatty degeneration of heart	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	....	1	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
97A	Pulmonary hæmorrhage	....	....	....	....	....	....	....	....
98A	Œdema of lungs	1	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	1	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	1	....	....	....	....	....	....
		2	1	1	....	....	....	....	....
	ALBERNI GROUP—ATLIN.								
	I.—GENERAL DISEASES.								
56	Alcoholism, acute	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	ALBERNI GROUP—BELLA COOLA.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	...	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	...	....	....	....	1	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
175A	Traumatism not specified	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	1	....
	ALBERNI GROUP—CLAYOQUOT.								
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	ALBERNI GROUP—FORT FRASER.								
	I.—GENERAL DISEASES.								
14	Dysentery	....	1	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77	Pericarditis	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
163	Other suicides	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	1	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	...	....	....	...	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
		1	1	....	1	....	...	....	....
	ALBERNI GROUP—HAZELTON.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	...	1	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
63A	Œdema of brain	1	....	....	...	....	...	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	ALBERNI GROUP—HAZELTON.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	..	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Cardiac paralysis	....	....	....	....	....	....	....	....
79B	Chronic valvular disease	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
93	Pleurisy	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
152A	Atelectasis	1	....	....	....	..	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroads, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	1	....	....	....	....	....	....	....
		4	1	....	....	....	1	....	....
	ALBERNI GROUP—POUCE COUPE.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	1
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187	Ill-defined organic disease	....	....	....	....	....	....	....	....
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	ALBERNI GROUP—PRINCE RUPERT.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
32A	Tuberculosis of spine	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
51	Exophthalmic goitre	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	ALBERNI GROUP—PRINCE RUPERT.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Cardiac dilatation, complicated by diabetes M.	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
81A	Atheroma	....	....	....	....	....	....	....	....
81B	Pyemia	....	....	1	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	1	....	....	....	....
93	Pleurisy	....	....	....	....	....	....	....	....
97A	Pulmonary œdema	1	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	1	..	....	....	....	....	....	....
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
114	Biliary calculi	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	1	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
145	Other diseases of the skin and annexa	1	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	2	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
151C	Hydrocephalus	....	1	....	....	....	....	....	....
152A	Atelectasis	....	1	....	....	....	....	....	....
153A	Still-born	1	....	....	....	....	....	....	....
153B	Premature	1	....	....	....	....	....	....	....
153C	Umbilical hæmorrhage	1	....	....	....	....	....	....	....
153D	Hæmorrhage of bowels	....	1	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		10	4	1	1	1	....	....	....
	ALBERNI GROUP—ANYOX.								
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	....	1	....	....	....	....	....	....
		....	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	ALBERNI GROUP—QUATSINO.	M.	F.	M.	F.	M.	F.	M.	F.
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	ALBERNI GROUP—QUEEN CHARLOTTE.								
	I.—GENERAL DISEASES.								
7	Scarlet fever	....	....	....	....	1	....	....	....
35	Disseminated tuberculosis, specify organ	....	....	....	....	....	....	1	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	1	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		1	....	....	....	1	....	1	....
	ALBERNI GROUP—STEWART.								
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
172	Traumatism by fall	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	ALBERNI GROUP—TELEGRAPH CREEK.								
	I.—GENERAL DISEASES.								
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	ASHCROFT.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
35A	Tuberculosis not specified	....	....	....	....	....	....	....	....
52	Addison's disease	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
71	Convulsions of infants	....	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	ASHCROFT.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	1	....	....	....	....	....	....	....
91	Bronchopneumonia	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
170	Traumatism by firearms	....	....	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		2	1	....	....	....	....	....	....
	BARKERVILLE.								
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	FORT GEORGE.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
110	Other diseases of the intestines	1	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
152A	Atelectasis	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187	Ill-defined organic disease	1	....	....	....	....	....	....	....
189	Cause of death not specified or ill-defined	....	1	....	....	....	....	....	....
		4	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	TETE JAUNE.	M.	F.	M.	F.	M.	F.	M.	F.
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
153A	Premature	1	....	....	....	....	....	....	....
153B	Protracted labour	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	1	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		3	....	....	....	1	....	....	....
	CLINTON.								
	I.—GENERAL DISEASES.								
9	Diphtheria and croup	1	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
113	Cirrhosis of the liver	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
176	Injuries by animals	....	....	....	....	....	....	....	....
		1	....	....	....	....	....	....	....
	LILLOOET.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Mitral regurgitation complicated by nephritis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92A	Lobar pneumonia	....	....	....	....	....	....	....	1
		....	....	....	....	....	....	....	1
	QUESNEL.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
79A	Mitral regurgitation	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
178	Excessive cold	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	150-MILE HOUSE.	M.	F.	M.	F.	M.	F.	M.	F.
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
172	Traumatism by fall	....	....	....	....	....	....	....	....
178	Excessive cold	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	YALE.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	1	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
166	Conflagration	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		1	1	....	....	....	....	....	
	FAIRVIEW.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
43	Cancer and other malignant tumours of the breast	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Mitral regurgitation	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	....
96	Asthma	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	FAIRVIEW.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
113	Cirrhosis of the liver								
115	Other diseases of the liver								
117	Simple peritonitis (non-puerperal)								
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis								
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia								
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature		1						
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms								
169	Accidental drowning								
169A	Traumatism in logging camp and sawmill								
173	Traumatism in mines and quarries								
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)								
178A	Exposure								
			1						
	GREENWOOD.								
	I.—GENERAL DISEASES.								
1	Typhus fever								
28	Tuberculosis of the lungs								
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum								
46	Other tumours (tumours of the female genital organs excepted)								
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy								
71	Convulsions of infants	1							
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis								
79A	Chronic valvular disease								
81	Diseases of the arteries								
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
87	Diseases of the larynx							1	
89	Acute bronchitis		1						
91	Bronchopneumonia		2						
92	Pneumonia								
92A	Lobar pneumonia								
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)		1						
109	Hernias, intestinal obstructions		1						
115	Other diseases of the liver	1							
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis								
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1							

DEATH, 1917.

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	GREENWOOD.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XI.—DISEASES OF EARLY INFANCY.								
152A	Atelectasis	1	1	....	....	....	....	....	....
153A	Premature	2	....	....	....	....	....	....	....
153B	Strangulation due to vomitus	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	1	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
		....	....	....	....	1	....	....	....
	GRAND FORKS.								
	I.—GENERAL DISEASES.								
6	Measles	1	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
	II.—DISEASES OF THE NERVOUS SYSTEM.								
61A	Meningitis, typhoidal	....	....	....	....	1	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Pneumonia following measles	1	....	....	....	1	....	....	....
92B	Pneumonia-hypostatic	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
104	Diarrhœa and enteritis (under 2 years)	1	....	....	....	....	....	....	....
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
110A	Enterocolitis	1	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
133A	Nephritis following scarlet fever	....	....	....	....	1	1	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	....	....	....	....	....	....	....
151B	Non-assimilation of food	....	1	....	....	....	....	....	....
153A	Still-born	2	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
165	Other acute poisonings	....	....	....	....	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
		8	1	....	....	3	1	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under one year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	KAMLOOPS.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—General Diseases.								
1	Typhoid fever								
8	Whooping-cough						1		
14	Dysentery								
20	Purulent infection and septicæmia			1					
28	Tuberculosis of the lungs								
29	Acute miliary tuberculosis								
30	Tubercular meningitis								
34A	Intestinal tuberculosis								
37	Syphilis								
39	Cancer and other malignant tumors of the buccal cavity								
39A	Cancer of face								
39B	Cancer of Æsophagus								
40	Cancer and other malignant tumours of the stomach, liver								
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum								
42	Cancer and other malignant tumours of the female genital organs								
43	Cancer and other malignant tumours of the breast								
45	Cancer and other malignant tumours of other organs, and of organs not specified								
46	Other tumours (tumours of the female genital organs excepted)								
54A	Anæmia, pernicious								
56	Alcoholism, acute								
	II.—Diseases of Nervous System and Organs of Special Sense.								
61	Meningitis								
64	Cerebral hæmorrhage, apoplexy								
66	Paralysis without specified cause								
71	Convulsions of infants	1	2	1	1				
	III.—Diseases of the Circulatory System.								
77A	Myocarditis								
78	Acute endocarditis								
78A	Endocarditis following rheumatism								
79	Organic diseases of the heart								
79A	Chronic valvular disease								
80	Angina pectoris								
81	Diseases of the arteries								
	IV.—Diseases of the Respiratory System.								
87A	Gangrene of lung								
89	Acute bronchitis								
91	Bronchopneumonia	1							
92	Pneumonia		1						
92A	Lobar pneumonia								
92B	Hypostatic pneumonia								
94	Pulmonary congestion, pulmonary apoplexy								
98A	Œdema of lungs								
	V.—Diseases of the Digestive System.								
102	Ulcer of the stomach								
104	Diarrhœa and enteritis (under 2 years)				1	1			
105	Diarrhœa and enteritis (2 years and over)								
108	Appendicitis and typhlitis								
117	Simple peritonitis (non-puerperal)								
118	Other diseases of the digestive system (cancer and tuberculosis excepted)								
	VI.—Non-venereal Diseases of Genito-urinary System and Annexa.								
119	Acute nephritis								
120	Bright's disease								
126	Diseases of the prostate								
	VII.—The Puerperal State.								
137A	Eclampsia								
	XI.—Diseases of Early Infancy.								
151	Congenital debility, icterus, and sclerema	2							
151B	Non-assimilation of food		1						
153A	Premature	1	1						
153B	Umbilical hæmorrhage	1							
	XII.—Old Age.								
154	Senility								

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	KAMLOOPS.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
159	Suicide by firearms	....	....	....	....	....	....	....	....
166	Conflagration	1	....	1	1	....	1	....	....
167	Burns (conflagration excepted)	....	....	....	....	1	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
175A	Traumatism not specified	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
186A	Syncope following operation	....	....	1	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
		7	5	4	3	2	2	....	....
	NICOLA.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
30	Tubercular meningitis	....	....	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
63A	Tumour of brain	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
81A	Aneurism	....	....	....	....	....	....	....	....
82	Embolism and thrombosis	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
170	Traumatism by firearms	....	....	....	....	....	....	....	....
172	Traumatism by fall	....	....	....	....	....	....	....	....
173A	Traumatism by railway construction	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		....	....	....	....	....	....	....	....
	PRINCETON.								
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
6	Measles	....	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151B	Non-assimilation of food	....	1	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.?		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	BEATON GROUP—REVELSTOKE—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	..	....	....	....	....
		....	1	....	....	....	....	....	....
	VERNON.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	1	....	....	....
10	Influenza	....	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	....	..	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
30	Tubercular meningitis	....	....	....	....	....	....	....	....
34A	Tuberculosis of intestines	....	....	....	....	....	....	....	....
37	Syphilis	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
44A	Cancer of face	....	....	....	....	....	....	....	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	1	....	....	....
47	Acute articular rheumatism	....	....	....	....	....	....	....	....
50	Diabetes	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
53	Leuchæmia	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	....	1	....	....	....	....	....
61A	Meningitis following typhoid	....	....	....	....	....	....	....	....
63	Other diseases of the spinal cord	....	....	....	....	....	....	....	....
63A	Acute anterior poliomyelitis	....	....	....	....	....	....	1	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
71	Convulsions of infants	1	....	....	1	....	....	....	....
76	Diseases of the ears	....	....	....	....	....	....	1	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78	Acute endocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Dilation of the heart	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
88	Diseases of the thyroid	....	1	....	....	....	....	....	....
92	Pneumonia	1	....	1	....	....	....	....	....
92A	Lobar pneumonia	....	1	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach and intestines	....	....	....	..	1	....	1	....
103	Other diseases of the stomach (cancer excepted)	1	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
115	Other diseases of the liver	....	1	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	1	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
134	Accidents of pregnancy	....	....	....	....	....	....	....	....
137	Puerperal septicæmia	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VERNON.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	....	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	1	....	....	....	....	....	....
251B	Non-assimilation of food	1	....	....	....	....	....	....	....
153A	Premature	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
172	Traumatism by fall	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
176	Injuries by animals	....	....	....	....	....	....	....	....
178A	Exposure	....	....	....	....	....	....	....	....
		6	6	2	1	3	....	3	....
	VANCOUVER CITY.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	....	....	....	....	....	....	....
5	Smallpox	....	....	....	....	....	....	....	....
6	Measles	....	....	....	....	....	1	....	....
7	Scarlet fever	....	....	1	....	..	1	....	....
8	Whooping-cough	1	2	....	....	....	....	....	1
9	Diphtheria and croup	....	....	....	1	2	1	1	1
10	Influenza	1	....	....	....	....	....	....	....
14	Dysentery	....	....	....	....	....	....	....	1
18	Erysipelas	1	....	....	....	....	....	....	....
20	Purulent infection and septicæmia	....	2	....	....	....	....	....	....
28	Tuberculosis of the lungs (Asiatic)	....	....	....	....	....	....	2	....
28A	Tubercular laryngitis	....	....	....	....	....	....	....	....
29	Acute miliary tuberculosis (Asiatic)	....	....	....	....	....	1	....	1
30	Tubercular meningitis (Asiatic)	3	3	2	2	2	3	2	3
30A	Tubercular peritonitis (Asiatic)	....	....	....	....	....	....	1	....
31	Abdominal tuberculosis	....	....	....	....	....	....	....	....
32	Pott's disease—tuberculosis of spine	....	....	....	....	....	....	....	....
32A	Tuberculosis of spine	....	....	....	....	....	....	....	....
34A	Tuberculosis of kidney	....	....	....	....	....	....	....	....
34B	Tubercular enteritis	....	....	....	....	....	....	....	....
35A	Tuberculosis not specified	....	....	....	....	1	....	....	....
37	Syphilis—congenital*	1	....	....	....	....	....	....	....
29A	Cancer of bladder	....	....	....	....	....	....	....	....
39B	Cancer of prostate	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
43	Cancer and other malignant tumors of the breast	....	....	....	....	....	....	....	....
44A	Cancer of lung	....	....	....	....	....	....	....	....
44B	Cancer of jaw	....	....	....	....	....	....	....	....
44C	Cancer of penis (Asiatic)	....	....	....	....	....	....	....	....
45	Cancer and other malignant tumours of other organs, and of organs not specified	....	....	....	....	....	....	....	....
45A	Cancer of Æsophagus	....	....	....	....	....	....	....	....
45B	Cancer of pharynx	....	....	....	....	....	....	....	....
46	Other tumours (tumours of the female genital organs excepted)	....	....	....	....	....	....	....	....
47	Acute articular rheumatism	....	....	....	....	....	....	1	....
50	Diabetes	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
51	Exophthalmic goitre	....	....	....	....	....	....	....	....
51A	Goitre not specified	....	....	....	....	....	....	....	....
52	Addison's disease	....	....	....	....	....	....	....	....
53	Leuchæmia	1	....	....	....	....	1	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
55A	Purpura hæmorrhagica	....	1	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
56A	Alcoholism, chronic	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VANCOUVER CITY.—*Continued.*	M.	F.	M.	F.	M.	F.	M.	F.
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis (Asiatic)	1	...	....	1	....	....	....	....
61A	Cerebro-spinal meningitis	....	....	....	....	....	....	....	....
63A	Acute anterior poliomyelitis	...	....	....	....	....	....	....	....
63B	Œdema of brain	....	...	1	....	....	....	....	....
63C	Tumor of brain	....	....	....	....	1	....	....	....
64	Cerebral hæmorrhage, apoplexy	1	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	...	....	....	....	....	....	....
68A	Cerebral thrombosis	...	...	....	....	....	....	....	....
68B	Cerebral abscess	....	...	....	....	....	1	....	....
69	Epilepsy	...	....	1	....	....	....	....	....
71	Convulsions of infants	8	1	1	1	....	....	....	....
76A	Otitis media	1	....	....	....	....	1	....	1
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77	Pericarditis	....	....	....	....	....	....	....	....
77A	Myocarditis	1	....	1	....	2	....	1	....
78	Acute endocarditis	....	....	....	....	1	....	....	....
78A	Endocarditis, following rheumatism	....	....	....	....	1	....	1	1
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
79	Organic diseases of the heart (Asiatic)	....	....	....	....	....	....	....	....
79A	Cardiac paralysis	....	....	....	....	....	....	....	....
79B	Chronic valvular disease	....	....	....	....	....	....	....	....
79C	Aortic insufficiency	....	....	....	....	....	....	....	....
79D	Fatty degeneration of heart	....	....	....	....	....	....	....	....
79E	Mitral regurgitation	....	....	....	....	....	....	....	....
79F	Cardiac dilation	....	....	....	....	....	....	....	....
79G	Cardiac embolism	....	....	....	....	....	....	....	....
80	Angina pectoris	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
81A	Aneurism	....	....	....	....	....	....	....	....
81B	Arterio sclerosis	....	....	....	....	....	....	....	....
82	Embolism and thrombosis	....	....	....	....	....	....	....	....
84A	Lymphangitis	....	....	....	....	....	1	....	....
84B	Hodgkin's disease	....	....	....	....	....	....	....	....
85	Hæmorrhage	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
87	Diseases of the larynx	....	....	....	....	....	....	....	....
89	Acute bronchitis	....	2	....	....	....	....	....	....
90	Chronic bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	11	11	1	....	1	....	....	1
92	Pneumonia	6	2	2	....	1	....	....	....
92A	Lobar pneumonia	2	1	1	1	....	....	....	....
92B	Pneumonia hypostatic	....	....	....	....	....	....	....	....
92C	Capillary bronchitis	1	....	....	....	....	....	....	....
92D	Bronchopneumonia, following infected fracture of hip	....	....	....	....	....	....	....	....
92E	Pneumonia following measles	....	....	1	....	....	....	....	....
93	Pleurisy	....	....	....	....	....	....	....	....
94	Pulmonary congestion, pulmonary apoplexy	....	....	....	....	....	....	....	....
96	Asthma	....	....	....	....	1	....	....	....
97A	Pulmonary abscess	....	....	....	....	....	....	....	....
97B	Pulmonary hæmorrhage	....	....	....	....	....	....	....	....
97C	Pulmonary embolus	....	....	....	....	....	....	....	....
97D	Septic pneumonia	....	....	....	....	....	....	....	....
98	Other diseases of the respiratory system (tuberculosis excepted)	1	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	1	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
102	Ulcer of the stomach	....	....	....	....	....	....	....	....
103	Other diseases of the stomach (cancer excepted)	....	....	....	....	....	....	....	....
103A	Hæmorrhage from bowels	....	....	....	....	....	....	....	....
103B	Duodenal ulcer	....	....	....	....	....	....	....	....
104	Diarrhœa and enteritis (under 2 years)	11	4	....	....	....	....	....	....
105	Diarrhœa and enteritis (2 years and over)	....	....	....	....	....	....	....	....
108	Appendicitis and typhlitis	1	....	....	....	....	....	1	1
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
110	Other diseases of the intestines	....	....	....	....	....	....	....	....
110A	Enterocolitis	1	....	....	....	....	....	....	....
111	Acute yellow atrophy of the liver	....	....	....	....	....	....	....	....
113	Cirrhosis of the liver	1	....	....	....	....	....	....	....
114	Biliary calculi	....	....	....	....	....	....	....	....
115	Other diseases of the liver	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	1	....	....	....	....
117B	Peritonitis, gastric ulcer perforated	....	....	....	....	....	....	....	....
118	Other diseases of the digestive system (cancer and tuberculosis excepted)	4	1	....	....	....	....	....	....
118A	Septic peritonitis	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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2	....	3	2	....	2	2	1	....	4	....	1	....	....	....	....	....	....	....	....	13	5	.....	18
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VANCOUVER CITY.—*Continued.*	M.	F.	M.	F.	M.	F.	M.	F.
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis (Asiatic)	1	2	....	....	1	....	....	2
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uremia	1	....	....	....	....	....	....	....
122	Other diseases of the kidneys and annexa	....	....	....	1	....	....	....	....
124	Diseases of the bladder	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
130	Diseases of the uterus	....	....	....	....	....	....	....	....
131	Cysts and other tumours of the ovary	....	....	....	....	....	....	....	....
133A	Parenchymatous nephritis	....	....	....	....	....	....	....	....
133B	Cholecystitis	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
135	Puerperal hæmorrhage	....	....	....	....	....	....	....	....
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
137A	Puerperal infection following miscarriage	....	....	....	....	....	....	....	....
137B	Eclampsia	....	....	....	....	....	....	....	....
138	Puerperal albuminuria and convulsions	....	....	....	....	....	....	....	....
139	Puerperal phlegmasia alba dolens, embolus, sudden death	....	....	....	....	....	....	....	....
140	Following childbirth (not otherwise defined)	....	....	....	....	....	....	....	....
141A	Pneumonia following childbirth	....	....	....	....	....	....	....	....
141B	Incomplete abortion	....	....	....	....	....	....	....	....
141C	Following Cesarotomy	....	....	....	....	....	....	....	....
141D	Ectopic pregnancy	....	....	....	....	....	....	....	....
141E	Puerperal fever	....	....	....	....	....	....	....	....
	VIII.—DISEASES OF THE SKIN AND OF THE CELLULAR TISSUE.								
142	Gangrene	....	....	....	....	....	....	....	....
145	Other diseases of the skin and annexa	....	1	....	....	....	....	....	....
	IX.—DISEASES OF THE BONES AND ORGANS OF LOCOMOTION.								
147	Diseases of the joints (tuberculosis and rheumatism excepted)	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	5	6	....	....	....	....	....	....
150A	Hæmorrhage neonatorum	....	2	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	12	4	....	....	....	....	....	....
151A	Accident of labour	1	2	....	....	....	....	....	....
151B	Non-assimilation of food	5	4	....	....	....	....	....	....
152A	Atelectasis	5	1	....	....	....	....	....	....
153A	Still-born	41	43	....	....	....	....	....	....
153B	Premature	22	19	....	....	....	....	....	....
153C	Umbilical hæmorrhage	1	....	....	....	....	....	....	....
153D	Melena neonatorum	....	1	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
155	Suicide by poison	....	....	....	....	....	....	....	....
156	Suicide by asphyxia	....	....	....	....	....	....	....	....
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
158	Suicide by drowning	....	....	....	....	....	....	....	....
159	Suicide by firearms	....	....	....	....	....	....	....	....
160	Suicide by cutting or piercing instruments	....	....	....	....	....	....	....	....
165	Other acute poisonings	....	....	....	....	....	....	....	....
167	Burns (conflagration excepted)	....	1	1	1	....	....	....	....
168	Absorption of deleterious gases (conflagration excepted)	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	1	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	1	....
172	Traumatism by fall	....	1	....	....	....	....	....	....
174	Traumatism by machines	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	1	....	....	....	4	....
182	Homicide by firearms	....	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VANCOUVER CITY.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES—*Concluded.*								
182A	Starvation—result of gunshot wound in bowels	....	....	...	....	....	....	....	....
182B	Traumatism in shipyard	....	....	...	....	....	....	....	....
186	Other external violence	1	1	....	....	....	1	....	....
186A	Shock	....	....	....	....	....	....	....	....
186B	Infanticide—drowning	...	....	....	1	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
187A	Dropsy	....	....	....	....	....	....	....	...
189	Cause of death not specified or ill-defined	....	....	..	....	....	1	....	....
		152	121	15	9	14	14	15	13
	SOUTH VANCOUVER.								
	I.—GENERAL DISEASES.								
1	Typhoid fever	....	...	....	....	1	....	....	....
7	Scarlet fever	....	....	....	....	....	....	....	1
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
29	Acute miliary tuberculosis	....	....	1	....	....	....	....	....
30	Tubercular meningitis	....	....	....	....	....	1	....	....
30A	Tubercular peritonitis	....	....	....	1	....	....	....	....
32A	Tuberculosis of spine	..	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	..	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
54A	Anæmia, pernicious	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
62	Locomotor ataxia	....	....	....	....	....	....	....	....
63A	Acute anterior poliomyelitis	....	...	....	....	....	....	....	....
64	Cerebral hæmorrhage, apoplexy	.	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
69	Epilepsy	...	1	....	....	....	....	....	....
71	Convulsions of infants	1	...	....	1	..	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77	Pericarditis	....	....	....	....	....	....	1	....
77A	Myocarditis	....	....	....	....	....	..	...	....
78	Acute endocarditis	...	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	..	....	....	....
79B	Cardiac dilation	....	....	....	....	....	....	1	....
79C	Cardiac sclerosis with rupture	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	...
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	1	....	....	....	....	....	....	....
90	Chronic bronchitis	....	....	....	....	....	....	....	....
91	Bronchopneumonia	2	1	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
92B	Hypostatic pneumonia	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
103	Other diseases of the stomach (cancer excepted)	....	1	....	....	....	....	....	....
110A	Enterocolitis	..	....	...	1	....	....	....	...
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	....	....	....	....	....	....
120A	Uræmia	....	....	....	....	....	....	....	....
126	Diseases of the prostate	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
137	Puerperal septicæmia	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	1	....	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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33	16	49	51	105	72	109	44	112	45	109	51	68	35	26	23	3	2	....	1	810	497	.....	1307

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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	SOUTH VANCOUVER.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	XI.—DISEASES OF EARLY INFANCY.								
152A	Atelectasis	....	1	....	....	....	....	....	....
153A	Still-born	9	3	....	....	....	....	....	....
153B	Premature	3	2	....	....	....	....	....	....
153C	Melena neonatorum	1	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	1
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	1	....	....	....	....
		18	9	1	4	1	1	2	2
	VANCOUVER DIVISION—POINT GREY.								
	I.—GENERAL DISEASES.								
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
41	Cancer and other malignant tumours of the peritoneum, intestines, rectum	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
63A	Primary lateral sclerosis of spinal cord	....	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
79A	Cardiac rupture following ulceration	....	....	....	....	....	....	....	....
81	Diseases of the arteries	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
89	Acute bronchitis	1	....	....	....	....	....	....	....
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
92B	Hypostatic pneumonia	....	....	....	....	....	....	....	....
98A	Œdema of lungs	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120A	Uremia	....	....	....	....	....	....	....	....
	X.—MALFORMATIONS.								
150	Congenital malformation (still-births not included)	....	1	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151	Congenital debility, icterus, and sclerema	1	2	....	....	....	....	....	....
152A	Atelectasis	1	....	....	....	....	....	....	....
153A	Still-born	1	....	....	....	....	....	....	....
153B	Premature	1	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
158	Suicide by drowning	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		5	3	....	....	....	....	....	....

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NORTH VANCOUVER CITY.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
1	Typhoid fever followed by hæmorrhage of the bowels	....	....	....	....	....	....	....	....
7	Scarlet fever followed by scepticæma	....	....	....	....	....	....	1	....
28	Tuberculosis of the lungs	....	....	....	....	....	1	1	1
30	Tubercular meningitis	1	....	....	....	....	....	1	....
30A	Tubercular peritonitis	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
42	Cancer and other malignant tumours of the female genital organs	....	....	....	....	....	....	....	....
44A	Cancer of throat	....	....	....	....	....	....	....	....
50A	Diabetes mellitus	....	....	....	....	....	....	....	....
56	Alcoholism, acute	....	....	....	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
65	Softening of the brain	....	....	....	....	....	....	....	....
66	Paralysis without specified cause	....	....	....	....	....	....	....	....
68	Other forms of mental alienation	....	....	....	....	....	....	....	....
71	Convulsions of infants	2	....	....	....	....	....	....	....
76A	Otitis media	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79	Organic diseases of the heart	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
79B	Mitral regurgitation	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
91	Bronchopneumonia	1	....	....	....	....	....	....	....
92	Pneumonia	....	....	....	....	....	....	....	....
92A	Hypostatic pneumonia	....	....	....	....	....	....	....	....
96	Asthma	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
108	Appendicitis and typhlitis	....	....	....	....	....	....	....	....
109	Hernias, intestinal obstructions	....	....	....	....	....	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	....	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
119	Acute nephritis	....	....	....	....	....	....	....	....
120	Bright's disease	....	....	....	....	....	....	....	....
124	Diseases of the bladder	....	....	....	....	....	....	....	....
131	Cysts and other tumours of the ovary	....	....	....	....	....	....	....	....
	VII.—THE PUERPERAL STATE.								
140	Following childbirth (not otherwise defined)	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
151C	Hydrocephalus	....	....	1	....	....	....	....	....
153A	Still-born	5	2	....	....	....	....	....	....
153B	Premature	2	....	....	....	....	....	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
175	Traumatism by other crushing (railroad, landslides, vehicles, etc.)	....	....	....	....	....	....	....	....
		11	2	1	....	....	1	3	1

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	NORTH VANCOUVER DISTRICT.	M.	F.	M.	F.	M.	F.	M.	F.
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	...
39A	Cancer of larynx	....	....	....	....	....	....	....	....
40	Cancer and other malignant tumours of the stomach, liver	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
81A	Aneurism	....	....		....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	1	.	....	....	....	....	....
96	Asthma	...	....	....	....	....	....	....	...
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Premature	1	...	....	...	....	..	....	....
	XII.—OLD AGE.								
154	Senility	....	....	....	...	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
169	Accidental drowning	....	....	....	....	....	....	...	....
169A	Traumatism in logging camp and sawmill	....	....	....	...	....	....	....	....
172	Traumatism by fall	....	....	....	....	....	....	....	....
		1	1	....	....	....	....	....	....
	WEST VANCOUVER.								
	I.—GENERAL DISEASES.								
44	Cancer and other malignant tumors of the skin	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Still-born	....	1	....	....	...	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
159	Suicide by firearms	....	....	....	....	....	....	....	....
171A	Traumatism by falling tree	....	....	....	....	....	....	....	....
		....	1	....	....	....	....	....	....
	VANCOUVER—OUTSIDE.								
	I.—GENERAL DISEASES.								
28	Tuberculosis of the lungs	....	....	1	....	....	....	....	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
64	Cerebral hæmorrhage, apoplexy	....	....	...	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
78B	Cardiac dropsy	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	...
92A	Lobar pneumonia	....	....	....	....	....	....	....	....
93	Pleurisy	....	1	....	....	....	....	....	...

DEATH, 1917—*Continued.*

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F'	M.	F.		
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CAUSES OF

Classification No.	CAUSE OF DEATH. (After the Bertillon Classification Causes of Death, Second International Decennial Revision, Paris, 1909.)	Under 1 year.		1 to 2 years.		2 to 5 years.		5 to 10 years.	
	VANCOUVER—OUTSIDE.—*Concluded.*	M.	F.	M.	F.	M.	F.	M.	F.
	VII.—THE PUERPERAL STATE.								
137A	Eclampsia	....	....	....	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
152A	Atelectasis	1	....	....	....	....	....	....	....
153A	Still-born	....	1	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
167	Burns (conflagration excepted)	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
169A	Traumatism in logging camp and sawmill	....	....	....	....	....	....	....	....
170	Traumatism by firearms	....	....	....	....	....	....	....	....
173	Traumatism in mines and quarries	....	....	....	....	....	....	....	....
176	Injuries by animals	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
		1	2	1	....	....	....	....	....
	RICHMOND.								
	I.—GENERAL DISEASES.								
8	Whooping-cough—followed by broncho-pneumonia	....	1	....	....	....	1	....	....
10	Influenza	....	....	....	....	....	....	....	....
28	Tuberculosis of the lungs	....	....	....	....	....	....	....	....
20	Tubercular meningitis	1	....	....	....	....	....	1	....
	II.—DISEASES OF NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE.								
61	Meningitis	....	....	....	....	1	....	....	....
64	Cerebral hæmorrhage, apoplexy	....	....	....	....	....	....	....	....
	III.—DISEASES OF THE CIRCULATORY SYSTEM.								
77A	Myocarditis	....	....	....	....	....	....	....	....
78A	Endocarditis following rheumatism	....	....	....	....	....	....	....	....
79A	Chronic valvular disease	....	....	....	....	....	....	....	....
	IV.—DISEASES OF THE RESPIRATORY SYSTEM.								
92	Pneumonia	....	....	....	....	....	....	....	....
	V.—DISEASES OF THE DIGESTIVE SYSTEM.								
103A	Hemorrhage of stomach	....	....	....	....	....	....	....	....
110	Other diseases of the intestines	....	....	....	....	1	....	....	....
117	Simple peritonitis (non-puerperal)	....	....	....	....	1	....	....	....
	VI.—NON-VENEREAL DISEASES OF GENITO-URINARY SYSTEM AND ANNEXA.								
120	Bright's disease	....	....	1	....	....	....	....	....
	XI.—DISEASES OF EARLY INFANCY.								
153A	Melina neonatorum	....	1	....	....	....	....	....	....
	XIII.—AFFECTIONS PRODUCED BY EXTERNAL CAUSES.								
157	Suicide by hanging or strangulation	....	....	....	....	....	....	....	....
169	Accidental drowning	....	....	....	....	....	....	....	....
186	Other external violence	....	....	....	....	....	....	....	....
	XIV.—ILL-DEFINED DISEASES.								
189	Cause of death not specified or ill-defined	....	....	....	....	....	....	....	....
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DEATH, 1917.

10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		60 to 70 years.		70 to 80 years.		80 to 90 years.		90 and upwards.		Age not given.		Total by Sexes.		Sex not given.	Total Deaths.
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
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SECOND MEETING

OF

MEDICAL HEALTH OFFICERS OF BRITISH COLUMBIA

HELD AT

LABOUR TEMPLE, corner Homer and Dumsmuir Streets, VANCOUVER, B.C.

SEPTEMBER 12TH AND 13TH, 1917.

Under the authority of Doctor the Hon. J. D. MacLean, Provincial Secretary.

MEDICAL OFFICERS OF HEALTH.

Present—

Dr. J. E. H. Kelso	Edgewood.
Dr. Isabel Arthur	Nelson.
Dr. M. Callanan	Barkerville.
Dr. H. W. Keith	Enderby.
Dr. J. P. Cade	Prince Rupert.
Dr. A. G. Price	Victoria.
Dr. F. Stainsby	Field.
Dr. H. C. Wrinch	Hazelton.
Dr. R. W. Large	Port Simpson.
Dr. J. H. Hamilton	Revelstoke.
Dr. S. Petersky	Lucerne.
Dr. G. H. Tutill	Merritt.
Dr. H. L. Turnbull	South Vancouver.
Dr. O. G. Ingham	Nanaimo.
Dr. W. F. Drysdale	Nanaimo.
Dr. G. deB. Watson	Burnaby.
Dr. F. T. Underhill	Vancouver.
Dr. S. O. McEwen	New Westminster.
Dr. W. E. Newcombe	North Vancouver.

F. F. WESBROOK, M.D., LL.D.,
President of the University of British Columbia.

SECRETARY TO THE MEETING:

H. E. YOUNG, M.D.,
Secretary, Provincial Board of Health, Victoria, B.C.

WEDNESDAY, September 12th, 1917

Morning Session.

The Convention was opened at 9.30 a.m., Dr. F. T. Underhill presiding.

The Chairman: Ladies and Gentlemen,—I think we may call this meeting open and commence our programme. Personally, I would like to offer you all a very hearty welcome to Vancouver; and while I am very glad to see you, I should have been still more pleased had there been a fuller attendance.

There are one or two points which I would like to emphasize. The first is, that those who rise to speak will kindly give their name and place of residence, so that the stenographer can keep a proper record. Secondly, we desire to have a free and open discussion on all subjects and any amount of criticism—hit as hard as you like—we want to learn, and we can do so at a meeting of this kind.

You will probably have noticed that no provision is made for any entertainment. It was thought that under the conditions in which we are now living such a proceeding might not be quite in place. However, the freedom of Vancouver, in so far as we can give it—outside of the Police Court—is open to you. The hospitals will be glad to see you; also the Health Department; for, while we are ashamed of our building, we have the material there if only we had proper space for it.

Dr. Young has kindly organized this meeting, and I will therefore ask him to be good enough to open it officially.

Dr. H. E. Young (Secretary, Provincial Board of Health): Mr. Chairman, Ladies and Gentlemen,—As you know, some two or three years ago we undertook a programme of holding annual meetings of the Health Officers of the Province, and had, in 1914, a very successful meeting, and it looked as if we were launched on a programme that would be of very material benefit to the Medical Health Officers, and also to the public in general. The matters that we wished to discuss were those, of course, which loomed very large in the Province, and in many cases we had no precedents to guide us. The conditions in the Province are such that these matters have to be met just as circumstances warrant. Unfortunately, following that meeting, war was declared, and, as a result, general disorganization of our staff in the Provincial Board of Health. Our men left—there have been some 200 members of the medical profession who have gone from British Columbia—and it was not thought advisable, under existing conditions, that we should continue the meetings at the time. However, war seems to be a fixed condition, and probably we might be pardoned now if we were to say, if there is anything in the expression, that business should go on as usual; and taking everything into consideration, and also the fact that in the near future, or we hope in the near future, there will be a cessation of the war and other problems will arise, such as immigration to the Province—we may be disappointed, but I feel that people in general are optimistic on this point, and in order that we may be able to meet these conditions, we thought it advisable to resume these meetings, and I have asked different members of the Medical Health Officers to give us papers.

The programmes which you have before you show that I have made a very good selection in the choice of the men from whom we are to have papers. The intention of their papers is to register their views and the results of their experience in the practice of the profession, but the chief thing I wish to bring about is the promotion of a discussion of these papers; to get an expression from those of you who are here to-day, coming from widely scattered points in the Province and to whom at times important questions arise which you have to decide without the possibility of your being able to get advice.

The Provincial Board of Health wishes the Medical Officers to feel that the Department is back of them in enforcing the requirements and regulations. When we come down to ultimate results, it is a matter of education—the people must be educated. It is difficult to enforce regulations when the enforcement interferes with the daily habits of the people or their personal liberty. They must be taught that they are individual members of a community, and that the health of the community depends entirely upon concerted action, and that the point of infection arising from one person neglecting to carry out regulations may result in serious epidemics and disorganization of business and death among the people of the community as a whole.

I propose to continue to carry out as far as possible the distribution of literature along these lines, and we hope that those who are reading their papers during the sessions will consider they are contributing a great deal towards the publication of pamphlets which will go toward the education of the people; and great benefits will be derived from active co-operation, and from the knowledge of the individual that what we are asking them to do is for their own benefit.

I look forward with a great deal of pleasure to listening to these papers and to the discussion of these questions.

I wish to thank Dr. Underhill for the splendid co-operation he has given me in the arrangements for this meeting, and also for kindly taking the chair.

The Chairman: As Dr. Young has said, I hope there will be a free discussion of all these papers. I would ask those who are reading to read as distinctly as possible, and also any one speaking to a paper to speak slowly and distinctly, and not to be disconcerted if any one asks them to speak up. The idea is for every one to hear what is being said.

The first paper is on "Child-welfare," by Dr. Isabel Arthur, of Nelson, B.C.

CHILD-WELFARE.

By Isabel Arthur, M.D., Medical Health Officer, Nelson, B.C.

Mr. Chairman, Ladies and Gentlemen,—It is a great pleasure for me to be here this morning. I was very much pleased to be asked to read a paper on this subject, but with the medical inspection of schools taken up by Dr. Brydone-Jack, and the infectious diseases by some one else, it left me another field entirely, not altogether medical, to go into, because I think "child-welfare" includes a great deal that is not medical.

There is nothing else around which so much centres on or which so much depends as on the child. It is the possibility of the nation, the hope of the future. It comes into the world helpless, born in all kinds of places and in all kinds of conditions, without any choice as to what these conditions are. One is born in poverty, another in luxury; one in the palace, another in the slums; one in the home of luxury, refinement, and education, another in surroundings of vulgarity and ignorance.

With life begun in such different circumstances it is hard to know just how far individual responsibility extends, but we must have individual responsibility, for without it we can have no law or order, and law and order are the essentials of civilization.

In order to try and equalize conditions and put all children in as good a position as possible to begin life, much time has been spent, and never before has the welfare of the child been so much before the mind of the State. This is in the right direction, but we are a long way from having it before the mind of the State as it should be. The child is the asset of the State, and all conditions should be arranged as far as possible to get the best results from that child. It is a business transaction, and results are what we are looking for in all business transactions. We do not want inferior products turned out that may answer the purpose, but as perfect a thing as can be produced—something to be proud of; something with stability and quality, that can be used for the purposes of development and advancement and for the protection, if need be, of the State to which it belongs.

Child-welfare is such a complex subject and has so many phases that it is difficult to know where to begin or where to end. The physical development of the child is so closely connected with its mental and moral development that one cannot be separated from the other, and so in discussing its welfare many things which do not seem to be physical must be taken into account. A child whose mental and moral development is taking place in unhappy or uncongenial circumstances has not the same choice to develop physically as one whose surroundings are pleasant and happy. Neither has a child who has a taste for certain lines of work and is forced into another line which he dislikes as good a chance of physical development, as the mental is in such close relationship to the physical that without harmony of the two the best results cannot be obtained.

It would seem that there should be very close harmony between the education department and the medical, for the real welfare of the child can hardly be considered from the physician's point of view without taking into account its school-life, hours of study, hours of play, and many other things that come directly under the education department. Hence this paper is not all medical. We all realize that the physical well-being of the child is of the utmost importance. We must have the healthy child, and how to get that is our first thought, and we must begin at the beginning.

In order to have the healthy child we must have healthy parents, so that the care of the child is prenatal. Some one said, when asked the proper time to begin the education of her child, "One hundred years before its birth." That has a great significance. "Do men gather grapes from thorns or figs from thistles?" is a very pertinent question in this regard. Do we get the fit from the unfit? This is the thought that should be before the mind of every one interested in the welfare of the child. It does seem as if we begin at the wrong end in dealing with many problems. We allow things to occur and then try to treat results. Now is the time

to get at the cause, and unhealthy parentage is the cause of many conditions found in the child. We *know* that all kinds of tendencies are passed from parent to child, even unto the third and fourth generation—tendencies to wrong habits of thought as well as to right habits of thought and action. This is law—inexorable law; and although we may disregard it, it prevails just the same.

When we want first-class wheat we plant first-class seed, and we get what we aim for. This is true all through nature, and in developing the resources of nature the fact is often taken into account. Not so in the human family, though. I asked the Registrar the other day if there were any restrictions on marriage. He turned up the book, and all the restrictions I could find referred to age. Well, I find no fault with that—it is wise, perhaps; but is that all? What about the man of mature age that is a drunkard or a drug-fiend, or an idiot or a degenerate of any kind, or the man who has gone far into the country of the prodigal son, and who has wasted his substance and his health in riotous living, or who has acquired disease in any way and is devoured with it; can he get a marriage licence and no questions asked? Oh, yes! Why spoil the romance of life for him? He has been sowing his wild oats, and now he must settle down and become a respectable citizen. There is a lovely sweet girl with whom he is in love—why interfere? Let all the earth keep silent! and let this dreadful tragedy be enacted; and all through the years the tragedy, never ending, follows that innocent girl and her children. The shame and injustice is appalling. "Honour thy father and thy mother," says the good Book; but how can the child honour the parent who has bequeathed to it a heritage of ill-health or evil tendencies? Too much silence has been our fault; mock modesty and a foolish idea that certain things must not be spoken about have led to fearful results. The world has not always been fair to the child. It has allowed it to start out with a handicap, and in our cart-before-the-horse style we try to remedy the result. We will look after these children; we will see that the schools have medical and dental inspection; we will improve sanitation and have good water-supplies, and make everything tend towards health. What nonsense! Why ever allow them to happen? If we can't prevent people from acquiring disease, we can at least prevent them from passing it on to innocent children.

My first thought, then, in child-welfare would be restriction of marriage licences. Any one contemplating entering into matrimony should be compelled to undergo a strict physical examination by a capable and conscientious physician, and be required to have a certificate of good health from that physician before a licence could be issued. "Oh, yes!" some one says, "but money will buy anything; it won't work." Quite true, it will not work if doctors are going to stoop to a low enough plane to be bribed, but we like to think of doctors occupying a higher place; and, besides, they *know* the result of marriages of the unfit and unclean, and if they cannot be counted on to protect innocent women and children, God pity us all.

Now, as perhaps never before, we need healthy children to take the place of those fallen in the war, and quality will count much more than numbers in this replacement, and careful attention must be given along every line tending to the conservation and elevation of human life. When the child comes into the world the problem of taking care of it begins, and was there ever such ignorance in regard to any other subject? The delusion that maternity brings with it the knowledge of how to do this is fast disappearing, and none too soon. The whole cry of to-day is for skilled workers, people trained to do their work. All trades and professions call for training for and knowledge of the particular branch of work undertaken. But what about young motherhood? The young girl marries and in the course of time finds herself a mother without ever having had a word of instruction or how to perform the duties of motherhood, and to give that child the attention and training it should have in order to make it into the best class of citizen it is capable of being. All the girl has is her own intuition and love for her baby, and she has to depend on getting advice from very incapable people in many cases, and the result is that her whole care of the child is experimental. The pity of it is that it results in a terrible wastage of human life, often of the best type, that might have been saved through the knowledge of some of the ordinary rules for the care of the child. Not only must she know the way to take care of it physically, but she must understand that that child is not all physical. She must realize that it is not an absolutely new thing that she can train in any way she chooses; while it is true that training does a great deal in the forming of the child's habits and preparation for its life, it is also true that that child has a disposition and traits of character that no amount of training can entirely overcome. It has tendencies to good or bad habits, a predisposition to

certain lines of conduct, tendencies to contract or resist disease, and a general make-up that is entirely his own; and surely it requires a great deal of knowledge, tact, and ability to mould and form that little personality and direct it along right lines, with wisdom enough to know when to develop and when to suppress. Truly some training is necessary for this great undertaking, for great it certainly is. But she gets none. She learns as she goes on and the child is always there to practise on.

How many young mothers know how to feed a baby properly if the natural food for some reason or other is lacking? The more the baby cries the more food it gets, and the more food it is given the more the baby cries. And so it goes on from bad to worse, until both mother and baby are physical wrecks. If by any good fortune the child survives, it often takes years to recover, and in many cases it never recovers altogether. This lack of knowledge of the proper way of feeding children does not end with babyhood. Indulgence is one of the crimes of our day. It begins in babyhood and goes all through life. The child must not be denied anything. It likes candy; therefore it must have candy, and plenty of it. Whatever the grown-up members of the family eat the baby must eat too, and the result is that the child is taking food quite unfitted for its digestion, and containing the wrong proportions of the different substances contained in food. For instance, many mothers do not know that meat and milk should not be given at the same time. Perhaps they have learned the fact, but if so they do not know the reason why, and so do not act on it. The child gets all the meat at once; it usually wants a good deal; and, of course, nearly all children have plenty of milk.

There is also a great deal of irregularity in feeding the child. The pantry is open to it at all times of the day, and the result is that when the regular meal-hour comes it is not hungry. It should be taught that the time to eat is at the regular meal-hour, and that it must eat slowly and masticate its food thoroughly in order to get a proper amount of saliva mixed in with the food to help to digest the starch contained in that food. To do this it is necessary to have plenty of time for meals. I don't know how a child can do this if the time allowed is only one hour; but of course it can't, and so we preach one thing and make conditions so that the child must do the opposite. One hour and a half is the very shortest time that should be given at the noon hour, for that is the principal meal of the large majority of children, and they should not have to "bolt" it and run. It would seem as if it would be a very wise thing to have a course for the "teen" age girl along lines that would train her for the duties and responsibilities of motherhood, a course that would give her an idea of the amount of food to be given to a baby and the proper length of time in between feedings, and the importance of regularity; the age when the child might be given solid food, and so on; also some instructions on clothing, so that they may know when a child has enough on and not too much. Too much clothing is a very frequent mistake, even more common than not enough. They should also be taught about the importance of sleep, fresh air, sunlight, and many more every-day facts.

The home-work problem, too, comes in when dealing with the welfare of the child. Play is as necessary to its development as work, and if the hours after school are filled with work, when can it get its play? Either play or sleep must be sacrificed and both are absolutely essential. It seems as if for many years the child should be able to get all its instruction in schools, and that the rest of the time should be spent in other ways. We should try to make conditions so that this may be accomplished. Even in high schools it seems as if the amount of home-work boys and girls are required to do is enormous. It is not the fault of the teacher; it is our system that is at fault. I think we are trying to fit round pegs into square holes and square pegs into round holes, trying to make the child develop along lines where it has no aptitude, instead of along the lines it likes. What we want to do is to fit the child for living, so that it may do well its life-work, whatever it may be, and to give it a sound mind and a healthy body, so that it can perform its tasks with ease and pleasure.

Sleep is a very essential thing for the child, and its importance should be kept constantly before the minds of parents. Who has not seen little children from the baby-in-arms stage up dragged out at night to all sorts of things—picture-shows, concerts, and even dances being well patronized. There is no objection to these things in themselves, only the child should not be there. It should be asleep, but the idea that the child must have the same as the grown-ups is becoming far too prevalent. How can any one think that night is the proper time to take a three- or four-year-old child to anything? By that time the child is ready for bed; development goes on so fast in the little body and mind and so much waste material has been thrown off that

it is in no fit condition to have more heaped upon it; but the mother must be amused, the child must be amused, and so out they go. Of course, this does not amuse the child; it only tends to tire and weaken it, and helps to place it later amongst the physically unfit. The child is very easily amused in reality, and if left to itself it shows this at every turn. Give it space and a few simple toys that it can "do" things with, and then it will have real amusement and real benefit. But the fault lies with the parents. The child is the toy of the household. We think we are amusing it when we are gratifying our own selfish desires. We like to see the child dressed up; we like to see it doing smart things; and so with wrong ideas of the whole child-nature we bring it up with wrong ideas of living and of the world it lives in.

A child whose whole idea of amusement and whose whole thought is of self, nothing but the material does it know anything about, and who is to blame? It has been brought up on excitement and amusement; it began when it was a baby; never a quiet moment did it have. When it was in its cradle it was rocked; when in its carriage it was shaken; if on any one's knee it was jumped up and down, then tossed into the air to land no one knew where, and thumped and patted, dandled till one became dizzy watching the performance. The child is formed the same as any grown-up person, and I don't believe we would enjoy all this diversion. It may be pleasant to be tossed into the air, but none of us are anxious to try it. The child should be kept quiet with as little handling as possible. It should have the use of its arms and legs and be allowed to use them freely, and should be allowed to develop itself. Gymnastic exercises for it given by some one else are not required. Nature takes care of all that, and all that is necessary is for it to be allowed to develop in nature's own way, but no such good luck! As it grows older our modern civilization seems to demand still more excitement for it. When Christmas or a birthday or any special occasion arrives, every one, father, mother, sisters, brothers, friends, and relatives, all conspire to give it a good time. The good time usually consists in working it up to the highest pitch of excitement; everything is piled on it; toys of every description, and never-ending, are there for a surprise, until it is so tired and worn out that there is no pleasure in anything for it. The day usually ends in its doing something very naughty, and the parents cannot understand how it can act so when every one was so good to it. One feels sorry for the child with too few toys and too little attention, but the child with too many toys and too much attention is more to be pitied. Too few people understand the simplicity and beauty of child-nature. The simplest thing amuses them; expense and costliness are quite outside its grasp, and we only flatter our own vanity when we heap costly things on it. All this is wrong, absolutely wrong. We must bring up the child so it will develop into the capable man or woman, strong in body and in mind. With so many of our best men gone we must have healthy and capable men for the future, or what will be the result? The past we have nothing to do with now, but we must strive to be the guardians for the health and welfare of the future.

The moving pictures figure so strongly now in the life of every child that it has become a real factor in its welfare. I have no objections to moving pictures for the child, provided the picture shown is of the proper kind and it is taken at the right time to see it. It is such a splendid opportunity to put such wonderful things before the child's mind, that there seems no reason why anything else should ever be allowed. I think all health authorities should take a great interest in the moving pictures, with the idea of getting things put on that are of an educative value, things that will not cause nerve-strain and mental exhaustion, and give the child a wrong idea of life.

Not long ago I went to the moving-picture theatre to see Hall Caine's story "The Deemster" put on. It is a tragedy from beginning to end; the place was filled with children; all ages were there, from the baby in arms up. When a terrible quarrel occurred between two men, a small child near me said: "What are they doing?" The answer was: "They are trying to kill each other, dear." Yes, just the simple little thing of murder and tragedy. A most fitting subject for the child to see! Is that the right thing to put before the child's mind? I do not criticize the play, but I do criticize the fact that children were allowed to see such things. Not only does it see tragedy, but even worse. It often has phases of life put before it that cannot help putting into its mind ideas that lead later on to loose habits of thought and action, suggestive things, that surely lower the standard of living; and lower standards of living tend to lower the race in every way, physically, mentally, and morally.

The child suffers a great handicap from the suppression of its natural curiosity to know things. All life and its problems are before it, and these problems are before the child-mind very

early. It seems to be a prevailing idea that a child's questions should be ignored or answered wrongly. It is true that its questions cannot always be answered, but in cases like that the reason for not answering them should be fully explained, and whenever possible the proper answer should be given. What difference if it does take a little time; there is always time for anything you want to do, and you never can spend time in a better way. The child with the alert, active mind is the one we want to develop, and in order to get the best results we must satisfy its desire to know the reason why. The whole child-life is "Why?" And when it is brushed aside with a "Don't bother me," there is something suppressed in that child which is invaluable. Then, too, it will often do a wrong thing because it does not understand, and very often a good explanation of the reason why certain lines of conduct are wrong will do it more good than a whipping. Not that I think whipping should be done away with altogether, but one should be very sure who is to blame before it is given. The child never forgets an injustice, and I think most of us carry in our inmost minds the remembrance of some perhaps very small thing for which we were punished when we did not deserve it. It has left a scar and a feeling of resentment. We must be just to the child, first and foremost. By that, I do not mean indulgent, for often the most unjust parents are the most indulgent.

So much harm could be prevented by frankness between the parent and child. The parent should explain the dangers that may beset it and give it a chance to avoid them. The child does not know much about the dreadful diseases in the world, so we should be fair and square enough to warn it in time. Prevention is better than cure, even if a cure can be effected, which is not always the case. The child who goes out into the world unwarned and ignorant, and, not knowing, who is led astray, has the right to ask its parents "Why?" You have only to walk up and down the streets in any city at night to see things that appal you. Young girls unescorted and dressed in a style altogether beyond their years and means trying to make themselves look attractive. Their mothers have never warned them; they have gone their own way from childhood, and many a girl that might have been innocent and healthy, a credit to society, is lost to all good, simply because her mother was careless. If parents only recognized their responsibility to the children and were frank and just enough to warn them, society would have fewer outcasts and much less disease to deal with. Not only does the girl need a guiding hand, but the boy as well. Many people forget that the boy has a hard row to hoe, perhaps even harder than the girl. He is allowed liberty because he is a boy, simply because results can not occur the same as in a girl. They forget that there can be awful results, far-reaching and degrading, resulting in loss of health and things that make life worth living. We are allowing the children the liberty of the adult without the knowledge of adult life to protect it. It is often blasé when it is sixteen, nothing left for it to know. Home-life is ceasing to be a factor in our civilization; too many attractions outside. The home must come into its own again; it is essential for the bringing-up of the child.

For the welfare of the child I would suggest singing. It is good for it, mentally, morally, physically, and spiritually. I wonder if the statement that the Canadian child is lacking in musical taste is true. If so, it is largely because it has been ignored as a national asset. Singing should be national. Almost every one can sing if he or she gets the opportunity, and the opportunity should be given to every one. Not that every one should be trained especially to sing, but music should have a very prominent place in every school and in every home. Singing makes a better child. It develops its lungs and puts into that child a something that is indefinable, but which we have all felt and which we all know. "The man that hath not music in himself, nor is not moved with concord of sweet sound, is fit for treasons, stratagems, and spoils." Let us try to put into every child's mind the memory of sweet song; let us have music as a necessary part of the development and training. No crimes are committed with songs on the lips; song is the accompaniment of joy and happiness, brave deeds, and noble impulses, and to me seems a most necessary thing in the full development of the child nature, which we all know is very complex, and which must be considered on all its sides; and, while not forgetting the physical, we must remember that it depends to a very large extent on the development of its other nature, mental, moral, spiritual, and æsthetic. We are not developing merely the animal, but something made in the image of God, and so this many-sided problem must be faced; and it is the study of a lifetime how to make the world a good place for the child to live in; how to fit the child to live as a child first, then as an adult capable of performing in the best way the various duties of life. We don't want the child just to be good; we want it to be good for something.

Too much cannot be said in favour of our public schools, and every advance made is of incalculable value. Although children are born in all kinds of conditions, here at last they are on an equal footing; here there are neither rich nor poor, high nor low, no class distinction. They are all children together with the same instincts, the same love of play, the same everything. Here is where the child gets his chance, rich and poor alike, and so everything tending towards the betterment of the school is well worth while. It is coming about that the bodily development is considered as important as mental development. We are realizing that the mind must exist in a healthy body to give the best results. There is a great deal to be done yet, for we have not yet reached the point where all may get attention free of charge if necessary. Many a child still has to bear the hardships incident to defective teeth, enlarged tonsils, the existence of adenoids, and many more diseases that react upon its mental improvement. Probably the greatest problem that the Medical Inspectors of Schools in towns and outlying districts have to meet is the impossibility of getting the teeth attended to. Dentistry is very expensive, and it is simply impossible to have teeth attended to when there is a large family. It is not much use to send the notice to the parents, "This child is in need of dental attention," when you know quite well there is not money enough to buy food and clothing. It almost seems as if the old saying, "Where ignorance is bliss, 'tis folly to be wise," would fit here. We are all looking forward to the time when we will have dental inspection as a necessary part of our school-life. So many ills are put down now to diseased teeth that one has to keep very sane in order not to become quite panicky when you see hundreds of children with diseased teeth, and you wonder if they really are all going to the bad.

There is one thing in connection with teeth that I would like to say, and I will give an example of what I mean. A boy aged about eight years was found to have no teeth, either above or below, on either side, beyond the canine teeth. When asked what happened to his teeth, he said that a doctor in a certain Prairie town had pulled them. "They were aching," he said, "and the doctor thought they might as well come out." "Was there not a dentist in the place?" was asked the boy. "Oh, yes," was the reply, "but the doctor always pulled our teeth." Yes, he pulled them all right, six-year molars and everything else. He made a clean job of it, but if he had seen the misshapen jaw I am sure he would not be very proud of his work. That child did not get any teeth for years. It is true this was worse than is usually found, but too often the six-year molars are pulled, and not often by dentists either, so I feel like criticizing the medical profession on this point. The six-year molar is the most important tooth in the mouth; it is the key of the arch, and should be saved whenever possible.

Goitre is one thing I see no hope for. It is very prevalent in Nelson; 180 cases were found in our schools last year, and there are probably as many more in children under school age and adults. No bad results have occurred from it. It seems to be all of the simple kind, but it is very disfiguring, to say the least, and any theories or knowledge of its cause would be very welcome.

In concluding, let me thank you for the privilege accorded me of reading this paper and for your kind attention.

DISCUSSION ON DR. ARTHUR'S PAPER.

Mr. Biker (Nelson): I wish to congratulate Dr. Arthur on her very capable and very broad view-point expressed in her paper. While I am only here as a layman, practically, among a crowd of doctors, I feel tempted to have nothing to say; but I can give you my view-point.

I might say, with regard to the curriculum in our schools, I think this subject might be included. Another salient point is that we have the future in our hands, and we ought to be able to handle that. How many of us as parents warn our children of the conditions they have to face? This is rather an important point.

I would like to hear more with regard to the question of goitre. I believe we have an awful lot in our town; this disease is very prevalent in the higher altitudes, and I believe about 90 per cent. is found in the altitude between 10,000 and 15,000 feet. I would like to hear more on that.

Dr. Petersky: First I want to congratulate Dr. Arthur on that paper. I think it is the most important paper on the programme. In my experience I have found that the ignorance of the people in this Province is appalling. To illustrate that: I had a little child in my care, the son of the Stipendiary Magistrate, who is supposed to be a man of judgment, and when food

was kept from this child for twenty-four hours, this man said he wasn't going to have that baby starved. After he saw the attack was cut short, he did have the grace to apologize.

With regard to the inspection of schools, I have inspected schools in a country district principally around the Cariboo, and I find teachers as a rule—though some of them are polite to us—they think we are a blamed nuisance coming and interfering with their work. That is the way they look at it. The average teacher is just as ignorant as to why schools are inspected; they didn't read the pamphlet sent out by the Government, and not a teacher was conversant with it until I carried out the system adopted afterward, of giving them one week's notice, telling them it was their duty to read it as a teacher, and they had certain duties to perform for the School Inspectors, such as examining the youngsters' eyes, and they could find out certain things which would come under their notice, such as a limp, or curvature of the spine, and it was their duty to look after such things as well as the education of the child. They think they have only to teach that two and two make four, etc. I think the Health Department ought to take that up and make the teachers realize that this is a very important branch of their work, and they may treat the School Inspector with a better spirit.

Then you take the average mother; that is a point to which I have given some thought, and although the general public limit their powers by making the laws of health, etc., I think the average mother should have a certificate that she has the education to fit her for her position. For instance, she should know enough about cooking not to poison her husband, and she should know enough about mixing various formulæ of milk in case it is necessary, and also know what disturbances may be caused in the stomach.

Personally, I haven't any children yet, but if I have I shall consider I have to put in my time to look after them; and as to entertainments, one of the parents—fortunately there are two—will have to stay home to look after the youngsters. I would not trust a child of mine to any nurse. In some cases children are left in the charge of women who drink, and what can be expected of the children if they have such a nurse for an example?

It is all very well for us to get together here and read papers as to what we ought to do, but how are we going to get people to believe we are not faddists and not carried away by our impulses?

Dr. Arthur suggested singing. I might carry that point a little further, and say any innocent amusements that will occupy their time; and for the parents, I think it should be made compulsory in the high schools and Normal Schools particularly that teachers should be obliged to take first aid and should be taught to respect the Medical School Inspector.

Dr. Vrooman (Medical Superintendent, Tranquille Sanatorium): I think Dr. Arthur's paper deserves much praise. I do not wish to take up much time on this question of "child-welfare," but there is one suggestion I should like to have taken into account—that is, the education of the parent. The parent cannot be educated by the physician, except partly. A great deal has been done in this city by the Child-welfare Committee, the Babies' Hospital, etc.; incalculable good is being done. Why not extend that beyond the City of Vancouver? Why not extend it into the rural districts by the appointment of nurses who will go to the rural districts and educate the mothers? We are not educating the mothers by making laws; it is a woman's influence with a woman that counts. A sympathetic nurse can do more than a medical man, and I think one suggestion arising out of Dr. Arthur's paper is that nurses be appointed for the rural districts in British Columbia.

Mrs. Clark: May I ask a question as to the point about goitre? It is a prevalent idea that water has something to do with it. I had an examination made of Vancouver water, and a physician said it would be advisable to give my children a small quantity of lime-water each day, and I did so; but very few mothers know about that, and many have asked me if the lack of lime did not cause goitre.

The Chairman: I was going to ask Dr. Young to give statistics on goitre later on.

Dr. F. W. Brydone-Jack: I had great pleasure in listening to the paper this morning, particularly the non-medical side of "child-welfare"; and then again the practical application with regard to dentistry, the prevalence of goitre, and the education of the parents.

In connection with the education of teachers, I think that could be arranged in Normal Schools by having lectures given on "child-welfare" by some doctors at some time suitable to the principals of the colleges.

In connection with the child-welfare movement, when down East this summer I saw the well-organized plan in Toronto. Whenever a child is born its birth is registered, and the Mayor sends a card of congratulation, telling of its value to the State. This contains a pamphlet of six pages describing methods of feeding, and illnesses, etc. It has twenty-eight child-welfare clinics, and a staff of nurses doing prenatal work in these child-welfare classes, and then the visiting of the school-children. In connection with births in the public wards of the hospitals, it is almost compulsory that these matters be attended to. Dr. Brown has charge of this work for the City Health Department in Toronto, and also the present head of the work in the Children's Hospital there. When a mother leaves the public ward she has to take the child to the child-welfare clinic once a week for measurement, weighing, diet, etc. If the mother neglects to do this—at the present time they can almost compel her to do it—they take the matter up in the Courts as a mother being neglectful of the child. But the majority of women take the children to the clinics without any trouble.

I think in New York there are about fifty-seven clinics, in Montreal twenty-eight, and they are spreading all over the country here. In Toronto they call them infant-welfare clinics, but they are child-welfare clinics because they look after children up to school age, and many defects which are found usually in children after entering school are in this way remedied before they come to school, because most of the defects found, as you know, in school-life should have been remedied two or three years before the child came to school.

Dr. Stanier (Medical Inspector of Schools, Oak Bay): I was much interested in Dr. Arthur's paper, and I hope she will let me have a copy of it, as I would like to take it home. Of course, by the very nature of that paper, it is sketchy. What I think would do a good deal of good would be something along the line of fiction, giving more intimate details of the bringing-up of children. There is no more popular book than "Helen's Babies" to show that a child should not bring up its parents. I think many of the clever writers to-day would be able to write something that would be humorous and well read by many mothers who are perfectly willing to know something about children, but do not like to be educated in the strict child-welfare way; but much that is informing could be introduced into a work of fiction, that perhaps would take up the first year of a child's life, or perhaps up to two or three years of age, and, later on, the school-life. Nine out of ten children born, I think, are born healthy, even if the parents are comparatively unsound; if properly fed and looked after the first year, they will grow up strong and healthy citizens and overcome tendencies to disease if properly handled during the first year or two. What the last speaker said about clinics is important, but I would like to see something written along the line of fiction, and I am sure it would be a book widely circulated and read.

I haven't time this morning to criticize much, and there is very little to criticize. With regard to teeth, I have seen a number of young children with their milk-teeth practically gone. There is a theory that the sticky white flour is responsible for it, or eating sugar at night. About the only instructions I give to parents about these things is not to let a child eat sugar after supper, or to thoroughly clean the teeth after doing so. I know the use of sticky, fine white flour produces decay and tends to disease much more than we are aware.

Dr. A. G. Price (Medical Health Officer, Victoria): I think we ought to be congratulated on having the opportunity of listening to such a valuable paper on "child-welfare," so very full from beginning to end. It is only twenty-four hours ago that I was attending a meeting at Victoria, where we are starting late, but we are starting a child-welfare campaign. I only wish this meeting had taken place a few days before or our meeting a few days after, so that I might have had the advantage of this excellent paper. It is so very full that to touch on all the points would be impossible in the time given, but one point I am rather interested in and would like to touch on is the prenatal child. I do not think that enough importance is placed upon this point. Only the other day I had a letter from Dr. Hastings, of Toronto, asking for information about the child-welfare movement in Victoria. I gave him the information, but finished up by saying, "You have got hold of the wrong end of the stick—you must get at the prenatal end." If you look through the statistics of the different cities—I know Victoria better than any other city—you will find an enormous death-rate among children under one year old, due to still-births, premature births, and malformations at birth. I can tell you, out of 101 or 105 of the infant deaths under one year old in Victoria last year, I think seventy-five were from prenatal causes—still-births, premature births, and malformations which we are in our present state of knowledge not able to account for. We know this: that maternal impressions are carried on to the offspring.

For illustration: In one case where a baby was expected in about five months' time, the mother was in a crowd, and a man came up and drove his elbow in her chest and made a dent and a red mark. The baby was born with that dent and red mark. It is a deep dent which with a little excitement gets red. Another case, just for illustration, is this: An expecting mother came to me with a little boy who had been rolling a hoop and had fallen on the hoop and cut his lip. She was in dreadful distress lest her baby should have a split lip. I laughed at her, to prevent her having the impression, but when the child did arrive it had a split lip in the same place where the older child had been cut by this hoop. I know of another case, where a butcher was lifting a piece of meat from a hook, and the hook fell and tore his face in a horseshoe cut. His wife at one time had broken her finger at the top joint. Three of their children had no top joint to the finger, and two girls had a horseshoe mark on the face.

Mental defects are carried down in the same way, and it is most important, I think, when infants are on the way, that expecting mothers should have some instructions. I would say that girls before leaving school should be given some instruction on how to live at that time, both mentally and physically. I come across many cases where the unfortunate mothers are out at work—husbands are ne'er-do-wells and the women are working for their daily bread. What can you expect to see in the offspring? I think this question should be brought up very fully.

There is one book I advocate in Victoria; I got it from the Provincial Department; it is published by the Metropolitan Life Insurance Company, and given away free, called "The Child." It first gives the prenatal treatment; the mother, her treatment; and the treatment of the child from the first, its feeding, etc. It is a very small book, but I have advocated that it be placed in every public school in British Columbia, in Canada, and in the British Isles. It is a most useful book, and unless you give the mother something to read she will forget what you tell her.

I wish to thank Dr. Arthur for her excellent paper.

A delegate: I think we should congratulate ourselves on having Dr. Arthur here, opening up new phases of child-welfare. In our schools, if we were in touch with the boys and girls on the fundamental principles of life, when they get out to work, they would have this knowledge to guide them, and I think a great many of you will agree with me that if this were done a great many diseases and imperfections in our children would be eradicated. The State would not be called upon to keep these children and we would be a better nation. To my mind this is the fundamental principle that we should carry out.

Mrs. Clark: I was convenor of the better-babies contest a few years ago, and we found a great lack of little pamphlets to distribute to the mothers. We were absolutely dependent on the Metropolitan Life for our literature, and we have thought since it would be an advantage to have the Provincial Government publish some little pamphlets to be distributed at such a time, when so many mothers and babies are congregated together.

Dr. Young: Our intention is to distribute as much literature as possible. The baby contest in the Province was a new feature, and there is now a pamphlet pertaining particularly to these points under publication which will be distributed very widely, especially through Women's Institutes.

Now, in reference to goitre, I found when I went into this some two or three years ago, in conversation with medical men, the question of goitre came up, and I took the matter up at the time, and called it to the attention of the Medical Inspectors, asking them to pay particular attention to it; and from their reports during the years 1915 and 1916—unfortunately our inspection was not carried out during the past term—but up to the beginning of the last school term there were 1,633 cases of goitre on the school reports. This is not by any means the number of cases in British Columbia, but a report simply of the children of school age; and it was very alarming. It was not confined to any one district in British Columbia; I found it from the north to the south and from the coast to the east border. Through the Okanagan the percentage of cases was probably much higher than in the other districts of the Province. I took the matter up with the medical profession in general, and asked the Victoria Medical Association and also the Vancouver Medical Association to conduct some investigations along these lines; and the Vancouver Association kindly took the matter up at my suggestion and appointed a committee; and I had an interim report from them, saying later in the season they expected to be able to give further data with reference to the matter.

In the course of investigations I found not only humans affected, but animals, very much affected. I took it up with Dr. Haddon, of Agassiz, and he confirmed this; and Dr. Tolmie,

Dominion Veterinary, asked me about it, and I gave him some figures I had, and he agreed that it was very alarming. He informed me that the existence of goitre amongst animals was so serious that it meant a very great economic loss, and he was asking the Department at Ottawa for sufficient funds to conduct an investigation.

The percentage of cases among the population of our Province is probably not greater than we should expect in a Province like British Columbia, where we have a shifting population. Following the knowledge I obtained in the reports, I wrote the Medical Inspectors and asked for their views, and they are agreed as to its prevalence; but unfortunately, owing to the carelessness of the profession, they did not pay any particular attention to the matter other than the fact that they regretted the condition, but I got what information I could from them with regard to their private practice.

There does not seem to be any consensus of opinion as regards its source or origin. The theory of water-inspection was applied generally to the Province, as we are a mountainous country and the source of our water is glacial, snow-water. Whether it is microbic or not, I hope to be able to ascertain. It is a matter to which the profession should give particular attention. It is alarming. There seems to be after puberty a decrease in the number of cases. We are not peculiar in the existence of goitre here, but probably in its distribution. In other countries and in the East they have these epidemics of goitre from time to time, and I wish the medical profession would keep this in view and try to arrive at some solution and advise the Department.

Mr. Biker: I believe we have localized within the District of Nelson over 400 cases in adults and children. Here, in my opinion, is a specially localized field, and I think, when an investigation is being made, we should have some investigation in Nelson, as we have so many cases.

Dr. Wrinch: I think we should be able to obtain some concrete results from this conference, which should be made as valuable as possible. With regard to disseminating information to the young, I have been pondering on that question for a moment after listening to this very full paper, and I wondered if it was sufficient to instruct the high-school pupils on questions of sex, maternity, etc., also on diseases. Would it not be possible to use our present organization of school examiners to speak upon these all-important matters to both sexes during adolescence and early adult life? I fear it would not be sufficient to wait until the children are in high school, because a great number do not attend high school—a large proportion do not; we must reach them earlier. Could not some arrangement be made whereby children could be taken by the Health Inspectors in the Senior and Junior Fourth classes before they scatter, taking the boys and girls separately and lecturing to them as to the evils to which they are liable? It is very important that they should be taken separately and that the instruction should be given by medical teachers and not by school-teachers.

In order that the information should be along the right lines and as carefully condensed as possible, perhaps the Department, by means of a little committee called together, could arrange a pamphlet of instructions to be given to Health Inspectors, outlining a course, so as to make the teaching uniform. These are just suggestions that have occurred to me as possible, whereby practical results along these lines could be obtained.

Dr. Isabel Arthur (replies to discussion): I think the greatest difficulty that I have found is to get the people to hear any papers or lectures on this subject. Several times I have advertised that I would give a talk on certain matters. When the time came I would look at my audience and I would not see a person there that I wanted to be there; that is, people who should be there were not there, and the people who were there already knew. I think it would be a very good idea if the Medical Health Officers were to publish in a weekly paper an article on "Child-welfare." It would not be a very hard matter to write a small article each week, and in that way get a great deal of information before the public.

As to the question of teeth, I have found in examining the schools that the Chinese boys and girls seem to have better teeth than our boys and girls, so I presume it has something to do with the food; whether it is sugar or not I do not know, because I do not know whether or not the Chinese are sugar-eaters.

About the difficulty between Medical Inspectors and teachers: I have not found any difficulty along that line. I think one has to give the teachers credit for being very reasonable and rational

in their treatment of the Medical Inspectors. I have not found the teachers in the schools I have had anything to do with anything but reasonable and rational, and they do everything I ask them to do.

I think the suggestion that a pamphlet be prepared by the Government as to teaching in the schools, public and high, is a very good one, and I think it would be a very good way to get the knowledge before the children.

The Chairman: Ladies and Gentlemen,—I have received a communication which I will read. (Reads communication from Dr. McKay Jordan.)

NOTE.—It is moved and seconded that it be laid on the table.

The Chairman: It has been moved and seconded that this be laid on the table. All those in favour say "Aye." Contrary, "No." The motion is carried unanimously.

The Chairman: I will now call on Dr. B. D. Gillies for his paper.

DR. GILLIES'S PAPER.

(The Provincial Board of Health regrets that they have been unable to get a copy of Dr. Gillies's paper at the time of going to press. They have, however, included in this report an account of the discussion on the subject-matter of "Mentally Defective Children.")

Dr. Margaret Pitcairn Hogg (of Victoria): I have listened with a great deal of pleasure to Dr. Gillies's paper. This subject is of particular interest to me, and I think there is a crying necessity in British Columbia that some institution should be formed for these people. I was Resident Medical Officer in such an institution near London, which supplied the needs of all the schools of the London County Council and several counties. We took these children from the age of about four or five, before they reached the school age, and kept them until they were sixteen, segregating boys and girls in different houses. They all attended school and each child had individual training. I think some provision should be made to show that they should not be allowed to go into the world to swell the army of unemployable. We have 2,000 acres entirely run by the boys from our schools. In British Columbia, where there is so much waste land, it would be a splendid thing for these children and adults to be put on a large farm and properly trained, as Dr. Gillies so aptly puts it, and keep them in proper associations as far as possible.

Dr. Turnbull (South Vancouver): I wish to speak in appreciation of the paper by Dr. Gillies, and to say that the points as uttered in his paper express my opinion very clearly in almost every particular. During the last year I think I have had seven cases come to me, most of them in families who have little of this world's goods, with some of the members of their family mentally deficient. Three of these cases could only be sent to Westminster Asylum, and that is not very satisfactory. Three were children; I scarcely think that is a proper environment for them. In two cases the mothers were dead and there were no friends to take them. We tried sending one to the Salvation Army for a time, but it didn't work out very well. The idea of a farm seems to me the proper idea. The Provincial Government, I believe, has had this under consideration for some time. I myself have written them, but they said they were unable to see their way now to do this, but I think they intend to take some steps in the near future regarding this matter.

Dr. J. H. McDermot (Vancouver): I just wanted to speak on one phase of the subject that Dr. Gillies did not bring in in his paper. We have enjoyed the paper very much, I am sure, and, as pointed out, there are a great many things we do not know; but there is one point that I think has not been touched upon very much, and that is the border-line cases as they appear in our schools.

Some little time ago there was some question as to establishing classes for mental defectives, and I tried to collect some data from the teachers, asking for the children in their classes. There were quite a number of names handed in, and I took each one of these pupils and examined them. We found there were more backward children than actually mentally defective children, and the trouble was due in many cases to defective tonsils and adenoids, and when these cases were properly treated a great many of these pupils came back to the class and kept up in the way they should be going.

When these children were eliminated the number of mental defectives in our city was found to be too small to institute a special class for them. Of those children who are left, they are in some cases children of alcoholic parents and of people who should not be at large, as far as we can make out; at any rate, they should not inflict such progeny on the community, and the

question is, how is this thing to be controlled? I would like to hear from Dr. Gillies something along that line.

Mr. Biker: I wonder if there is anything in the view-point of the number of children in a class in school? In some cases there are forty-five or fifty pupils in a class. How is it possible for a teacher to attend to that number if 20 per cent. are backward children?

Dr. Stanier (Victoria): Victoria City has a class supposed to take care of mentally defective children, but there is no compulsion to take them out of a regular class and put them into this class for instruction. No doubt the education is much better carried out along the kindergarten lines than along ordinary rules, and I think it would be well to establish a farm colony. I find the trouble is the parents are often mentally defective also, and you have great difficulty in convincing them that their offspring are not right. It is upsetting the class, having such children in it, and I think some compulsion should be brought about; it should not be optional with the parents whether the child be sent to school or to the class for mentally defectives, or the farm colony.

Dr. Petersky: I am very glad the last paper has taken up that point. I think it is a most important point. I think this is up to the Health Department. The teacher should be made to report children who stay more than two terms in one class. There should be an investigation by a medical man to find whether the child is mentally defective or not. If the child is mentally defective, it should be removed to a special school or institution where the others are in the same fix and the grades are standardized. In other words, it creates the environment Dr. Gillies spoke of. There are some boys and girls who have a tendency to be mischievous, and if put among thieves they become thieves. I think we should take this matter up; it seems to me the Provincial Government are neglecting the Health Officers' Department shamefully in a way. You cannot make the ordinary layman see that it is important.

Dr. F. W. Brydone-Jack: It gave me great pleasure to listen to Dr. Gillies's paper. Personally, I want to see action on this sooner than on anything else that may be brought up here. In Vancouver we have twenty-four children attending the mentally defective classes. There are in addition about fifty in Vancouver who should be attending them. We cannot get enough teachers to handle them; the School Board has not seen its way to appointing a sufficient number to handle the whole feeble-minded proposition in Vancouver; but in regard to sending children to the class, the Municipal Inspector has the power of defining the school which any child shall attend, and if we report to him that a certain child in a certain school is mentally defective he can tell the parents that he assigns the child to this class, and the law supports him. We have only given that power in a few occasions, as we haven't enough teachers to look after the number we have here.

I think the educational authorities can look after the education of the feeble-minded children up to the age of twelve or thirteen years. After that they become a harder problem to deal with. After girls get to that age, we from time to time have them in the Law Courts for having been taken unfair advantage of by men; we had two or three cases last year, and a case the other day, and it is up to us to look after these children. The only way to protect them is to put them into an institution such as Dr. Gillies has suggested. We can teach them manual training and domestic science and make them self-supporting, but they should have constant supervision. In the Old Country they find turning them loose in the world is wrong, because they do not attempt to remain employed and become criminals. We could keep them in a colony farm, where they could be self-supporting. At the present time they are turned loose on to the community at sixteen or seventeen and they become troublesome, and may later become criminals. A number of parents have approached me and asked if it could not be arranged to have the Government take charge of their children; they know they cannot handle them, and want Government control, as that is the only way of looking after them properly.

When in Toronto in July I had a talk with Dr. McMurchie, mentioned by Dr. Gillies, regarding the farm-colony control of these children, and she suggested that in British Columbia we should start in a small way, say in a good-sized house having eight or ten girls under a suitable matron, and then, as the fund increased, more buildings, and then have the farm-colony principle.

Mrs. Clark: Speaking for the Local Council of Women in Vancouver, this question has been of vital interest to us for some years, particularly since the beginning of the war, and last June we had a very able paper, and a resolution went forward asking that such an institute

as mentioned be established in British Columbia, not for the Dominion, but one for our own Province.

Dr. B. D. Gillies (replies to discussion): I do not think we should leave these children or throw them on the public at the age of sixteen. This is especially the time we want to have hold of them. They are ready then to go out and propagate and everything else, and just carry on what we are trying to control; and it is most essential that the Government should have permanent control of these people. We make them self-supporting; they are self-supporting in a proper environment, but they should be kept under control.

There are a lot of things that one could have touched on, but it was utterly impossible for me to have prepared a paper of that character. I know it was deficient in many respects. I cannot deal with the method of organization of caring for these cases, but if we have a place where we can treat them, we will find out those deserving of such treatment.

I wish to thank you for the way in which you have received the paper.

Dr. Turnbull: I would like to make a resolution—that the Medical Health Officers and Medical Inspectors draft out and present a resolution that the Government should take steps to make some arrangement along this line.

The resolution was seconded and carried unanimously.

The Chairman: I will now call upon Dr. Stanier for his paper.

VACCINATION.

By F. T. Stanier, M.D., C.M., Medical Inspector of Schools, Oak Bay, B.C.

Mr. President and Gentlemen,—I believe I am called on to read a paper on that threadbare subject, "Vaccination," because as Inspector of Schools in Oak Bay Municipality I was fortunate enough to have a Board of School Trustees sufficiently enlightened to take my suggestion during the recent outbreak of smallpox, and under the "Health Act," section 7, subsection (11), compel every pupil attending either to be vaccinated or procure a certificate of exemption before they could be admitted to the school.

The Victoria Medical Society had previously passed a resolution that the fee should be $1. The children were told to apply to their own medical men and were given three weeks. Toward the end of that time I attended at the schools and vaccinated a few who had no doctor who brought their dollar with them, and a few more who wished to be vaccinated but had no dollar. The conscientious objectors numbered more than I expected, noticeably among the poorer and more ignorant parents, many of whom were worked up by the usual extravagant letters to the papers by objectors who quoted horrible instances of infection; all of which occurred at remote times and places, and were past disproof, but not without influence.

I found that the giving of certificates of successful vaccination was not being carried out, and not to make too much fuss I examined many who had been vaccinated and had not got certificates, and in doing so I was struck with the many different ways vaccination and the after-treatment of the sores is done, and this paper is a plea for uniformity in this little operation.

One man makes four marks, another three, and another only one. One doctor puts on a shield, another a great thick dressing of cotton wool, and a third neither washes the arm nor puts on any covering. It is immaterial whether vaccination is done on the leg or the arm (one pretty little maid showed me her thigh—"We put it here in France," she said), but four, or at least three marks and an after-treatment that allows them to go unbroken through the vesicular and pustular stage are essentials of successful vaccination.

To cut this paper short, I will tell you the method I employ and the reason. The subject is then open for discussion.

The child is instructed to be clean and have clean underclothes. I wash the site chosen with plain water and a piece of absorbent cotton and dry it with absorbent. This, of course, is no more than burning a joss-stick to surgical cleanliness; but I ask you, if you took a thousand healthy, clean children and pricked the three marks without vaccine, how many would become infected? I next squeeze out the vaccine in three places, if the arm is fairly large, in a triangle, two above the insertion of the deltoid and one below. On a thin arm three vertically in that neighbourhood at least 1½ inches apart. Then with a sharp-pointed needle that can be sterilized in a spirit lamp flame make about eight or ten very superficial stab punctures on each mark and lift the epidermis with each puncture. It is quite painless, much quicker than scarifying,

much surer to take, as no blood is drawn and very much less danger of immediate secondary infection. There is no waiting until it dries. The clothes are pulled down and out goes the patient.

I tell them it must be kept dry until the scab comes off. The only dressing allowable is a piece of soft linen sewn inside the sleeve of the undershirt. Almost any dressing more than this will cause the pustule to sweat, soften, and break down into an open ulcer, with liability to secondary infection; and, worst of all, the protective serum that is grown under that hard scab with the intention that it should be absorbed into the system in sufficient quantity to give protection (for that reason at least three marks) is discharged in the dressing, and though the scars remain to show vaccination, that patient has very little more protection against smallpox than the unvaccinated, and if an epidemic occurs goes to swell the statistics against the value of vaccination.

The method described has been used for some time in the military camps in Toronto with a more elaborate antiseptic preparation of the arm. I have no doubt many of you have tried it and can endorse my claim that it is easy, quick, sure, and painless; and if no dressing is permitted, the scabs allowed to harden, and the serum formed in the vesicles to be absorbed, the protection afforded will be much greater than obtains with the present haphazard methods.

This little operation and its results are seen by the public from start to finish, and when you are asked, "Why does Dr. S. only make one mark and put a thick dressing on it?" it is not going to add to the professional amenities or the public confidence to explain your theory. For that reason, if this meeting sees fit to endorse this, or any better, method of vaccination, I should like to move that a memorandum of some uniform procedure be sent to the medical societies for discussion and adoption.

DISCUSSION ON DR. STANIER'S PAPER.

Dr. A. G. Price (Victoria): In opening the discussion on this vast subject, I feel like one plunging into the ocean, rough on the surface and filled with submarines underneath, because it has been a subject which for years has been under discussion by the general public—the subject of vaccination. But I do not need to plunge into the ocean. I have to thank Dr. Stanier for throwing out two lines—as I am in the sea—to rescue me from getting into the deep. These are, first, the law in relation to compulsory vaccination; second, the methods of procedure in vaccination; and I will try to connect these two.

The section referred to is section 7, subsection (11); that section states that all children attending public schools shall be vaccinated or shall give a certificate of exemption. This law, unfortunately, is not enforced. Why is it not enforced? Because of the second part, as to giving a certificate of exemption under the conscience clause, where the parent of a child may come and say that he objects to vaccination under conscientious scruples. A man told me: "I don't care a rap about my oath, but I am not going to have something injected into my child." Now, that man was both ignorant and immoral—immoral because he did not care about his oath, and ignorant because he did not take pains to find out just what it meant. About 80 per cent. of the parents are anti-vaccinationists. It is either a case of ignorance or prejudice because they are proud. They are ignorant in that they have not given any time to study the matter and have heard the tittle-tattle of other people, and are carried away with the rubbish you see issued by the anti-vaccinationists. They judge the case before they hear it. They have made up their minds that so-and-so didn't get smallpox and were not vaccinated, and what is the use? They are prejudiced and they are proud. Some people say: "We are Britons. We do not submit to our liberty being taken." The word "compulsion" is much against the feelings of a Briton. But in a case of this kind, if they can only be educated in this matter and can understand more about the uses and the protective properties, they would waive their idea of lost liberty and have their children vaccinated. With the conscience class that is in the Act we will never be able to compel children to be vaccinated. The law should be passed that they should be vaccinated or produce a certificate from the parents.

We now come to the method which Dr. Stanier mentions. I am afraid it is due to wrong methods that a great many anti-vaccinationists have some ground to stand on. I am afraid there are a host of medical men—I do not say so in this country, but I am speaking now of my own country, Ireland—I remember when we started vaccination as students a good many years ago, we were shown into a large room in the vaccination institution of the City of

Dublin, and we would have perhaps fifty children down one side of the room and an equivalent number on the other. One lot of children had been vaccinated the week before; the others were the new children to be vaccinated. As you probably know, Dublin is a very poor city, and the mothers would come out the same as though they were going to church to have their children vaccinated; they would put on their best clothes or borrowed clothes, and no idea of asepsis at all. All stood there together—children brought from anywhere. It is hardly an exaggeration to say that in some cases we had to look for their arms under the dirt. I am afraid in these cases it would not be simply a scratch on the arm without having some washing or some antiseptic used first, but the worst of the performance was we would take the serum from one arm, with no question as to health, and walk across the room and stick it into the arm of a child on the other side. They would come back in a week's time, some with bad arms, but we did not see them after a fortnight's time. This is an extremely bad method, and the anti-vaccinationists had some grounds to stand on, because they would say: "We are inoculated with impure vaccine and the children have bad arms." That is quite true, and the mothers were not told how to treat the arms.

In order to safeguard ourselves, I think we should be very very particular about the asepsis of the arm. We should be particular also in telling the parent how to treat them afterward. First of all, if you do not tell the parent how to treat it, and if you do not cover it with something, they will look upon it as a mere scratch and continually look at it, finger it with dirty fingers, and you have trouble before the week is up.

As far as antiseptics go, I never used antiseptics that will remain on the skin, but I always swab the section with ether or alcohol. That completely evaporates and leaves no antiseptic behind which may destroy the activity of the vaccine virus; but it is better to always use thorough washing before scratching the skin.

Then, as to the number of marks you put on, I think there, again, circumstances alter the cases. Efficient vaccination I think requires three marks, but you might come across a very small child, with an arm so small that there is not room for three marks on the arm, unless they are all in a line, and they would take up the whole length from the elbow to the shoulder —very emaciated arms. I think, in a case like that, efficient vaccination with one or two marks will continue for a year or two or three years, and after that they should be revaccinated when coming to school age. If you can put on three, that is the English number—four are required now—all the better: but I do not think it is wise to make four marks on a child whose arm is so small.

As to the putting-on of cotton-wool, I always scorch a piece of cotton-wool, hold it to the fire until is charred, and put it on with three pieces of sticking-plaster. I do not put it on thick. Sticking-plaster must not encircle the arm; but this impresses the mother that a surgical operation has been performed, and also keeps it clean; it also protects it from being scratched or knocked in any way while the child is about. You also tell the mother not to look at that mark under three or four days. You also tell her under no circumstances to get it wet, for if it is wet the wool, of course, turns to a poultice and softens the skin, and you have a much worse arm. The heating of the wool can be obviated by not getting too much wool on and telling the mother not to put heavy clothes on the child.

If there could be some uniform method of conducting the little operation it would be a very advisable thing, because I am afraid there is a great deal of diversity in methods and other neglect, sometimes for the asepsis, and we have inflamed arms, and the parents object very much to vaccination, and they have a foundation to stand upon in that case, so that it helps to swell the crowd of anti-vaccinationists.

Dr. Brydone-Jack: In our public schools not more than 10 per cent. have been vaccinated, and I think it is getting worse every year. If smallpox should come along we would have a bad time, the same as they did in Montreal, where they had many deaths when smallpox came upon them. I think it would be well to make them produce a certificate of successful vaccination or produce a certificate from a Magistrate under the protection clause.

Dr. Large (Port Simpson): We have to consider that a great many people say of the efficacy of vaccination as they say of the efficacy of many other things, "Well, we have been free from epidemics in the past and do not think we will have them now." I have been here for about twenty years in the medical profession and have vaccinated quite a number, but I have yet to treat a case of smallpox. While we referred to the Montreal epidemic, there were

two things to be considered—lack of vaccination and proper precaution to isolate these cases. A great many people firmly believe in vaccination, but say there is so little risk of smallpox spreading under the stringent regulations at present that conditions have altered, and when it comes to a question of putting three or four scars on the arm, they object very strongly to that, under the present conditions.

Dr. Isabel Arthur: I think the only way is to have an epidemic and every one will be vaccinated. In our town a few years ago we had an epidemic of chicken-pox, so it was reported, and at last some one conceived the idea of smallpox. Children were in the schools—I found it everywhere—they were not ill; but some symptoms appeared like smallpox in several cases—many did not. In the whole course of the epidemic there was no case in which there was secondary fever, and there were no deaths. I vaccinated many children who had certificates of conscientious scruples against it, and I would rather in that case have had the disease than the vaccination and its attendant results. If that is smallpox it is changed materially, and we ought to destroy all the information we have in the text-books on smallpox, because that wasn't like anything I had heard of.

Dr. Petersky: I didn't intend speaking on this paper at all, but a few remarks of Dr. Large brought me to my feet. Every one of us who believes in vaccination is, I take it, vaccinated. Personally, as a Medical Health Officer, I believe in the various health laws I am called upon to perform. I believe in the theory of vaccination; if I did not, I would not attempt to carry out the Vaccination Act. I believe in it so thoroughly that I have a feeling, if I heard of any smallpox around in the community in which I am living, I would immediately be vaccinated myself, as it gives me a feeling of tranquillity, and these little scars are nothing; you might fall down and cut yourself and have a scar for life, and look what the other scars do. Any medical man who has followed the theories of bacteria and vaccination in general cannot help but believe in the theory of immunity. I think this conscientious objection should be entirely eliminated from the Act.

The Chairman: I would like to give you a warning. We are going to have an epidemic of smallpox with 30 to 40 per cent. of deaths some day. I was brought up amongst smallpox. We have had nine officially reported cases of Asiatic smallpox with three deaths this year in the City of Vancouver; some of the patients said they had been vaccinated, but they had no scars or marks. The disease was brought in on a boat from the Orient. This is not the first time we have had this form of smallpox in Vancouver. Where you have an organized Health Department you have some opportunity of dealing effectively with this or any other disease, but where the Health Department is small and inefficient it is not so easy.

Some time we will have smallpox in this country if the people are not protected by vaccination. We tried several years ago to carry out the Vaccination Act in this city, but owing to the *furor* created by the anti-vaccinationists, and thanks to the conscience clause, the attempt came to nothing. To prove that the Act was worthless, I opened vaccination stations in ten public schools and only 200 children were vaccinated. I do believe, however, that if the provisions of the conscience clause were enforced and a statement properly sworn before a Notary required of the objectors, we should find very few conscientious objectors. Probably the real objection to vaccination is that the parents do not like the trouble involved by the sore arms consequent to the operation. I have never seen any of these certificates; the parents usually send word to the school that they object. I want to see the certificate required by the conscience clause insisted upon, and then we shall see almost universal vaccination.

Dr. Stanier (replies to discussion): I thank you for supporting me in my opinion regarding smallpox. I have not seen any, but I have only to read statistics of former epidemics. Sometimes you have a mild chicken-pox epidemic that doesn't mean much, but I am thoroughly convinced if smallpox gets loose in unvaccinated communities you will have a serious state of affairs.

Reads clause 15 of the Vaccination Act as follows: "It is now deemed necessary, and is hereby ordered, that teachers in public schools and high schools or colleges shall require a certificate of successful vaccination from each child attending at such school or college, or a certificate that such child is at that present time insusceptible to vaccination. The certificates shall be presented on demand to the teacher or other proper authority."

In enforcing that Act, or that clause, the school trustees or municipal authorities have discussed it, and in some places they have been ignorant and thrown it down, but in Oak Bay they

had their own children vaccinated and brought that clause in. I do not know that we are so successful as we might have been.

Dr. Price, I think, has missed my point of view—he wants to leave it optional. I maintain, without three marks, you will not have sufficient serum generated. If you can get it in one mark, it has to be the size of a 50-cent piece, and then you have a great, big, ugly scar. I have not seen an arm so small that you could not put three marks on, 1½ inches apart. That makes an arm about 4 inches long from the upper to the lower part. I am firmly convinced that at least three marks are necessary to manufacture that quantity of serum.

These children I vaccinated were clean and not slum children. There is no objection to using an ordinary antiseptic to clean off the arm, but the point I wanted to make was that this method of vaccination, which just lifts the epidermis with the point of a needle, was quite effective, and while it might take a little longer to take, it has been found rapid and efficient by the military authorities in Toronto, and it is painless. The children do not mind this form of vaccination, as they do not realize about the aftertake.

I do not know that there is any other point worth mentioning. I think I have answered all the questions that were asked.

The Chairman: That brings us to the conclusion of our morning session. We meet again at 2.30 this afternoon. I have taken up the question of a committee on resolutions. You will remember we had one four years ago to draft out various resolutions that were suggested, and Dr. Young has asked that the following constitute such committee: Dr. Large, of Port Simpson; Mr. Biker, of Nelson; and Dr. Stanier, of Victoria.

The meeting then adjourned at 12.30 till 2.30 p.m.

Afternoon Session.

The Convention resumed at 2.30 p.m., Dr. Wrinch presiding.

The Chairman: I shall have to ask your kind assistance in helping me to obtain order in this very large assembly. I know you will kindly overlook any irregularities or such matters as might be expected in one who has been so long out of civilization as I have, and give me your kindest assistance in carrying on the meeting.

I will now call upon Dr. Underhill—I do not suppose he would like me to call him the father of the health of the Province, but one of the senior health-men of the Province—who is to give us a paper on the "Control of Infectious Diseases."

CONTROL OF INFECTIOUS DISEASES.

By F. T. Underhill, F.R.C.S., M.R.S.I., D.P.H., Medical Health Officer, Vancouver, B.C.

Mr. Chairman, Ladies and Gentlemen,—The subject upon which I have been asked to address you—namely, the "Control of Infectious Diseases"—is one which opens up a vast field of thought in which there are many diverse views and much room for controversy and speculation. It is not, however, my intention to approach this subject from the academic point of view, but rather as a Medical Health Officer who has to deal with it from the mere sordid and practical standpoint.

I may, perhaps, be pardoned if I cite the difficulties of my own city by way of illustration. In the first place, there is the question of cases of an infectious nature in transients. These are always an unknown quantity, and as they are usually to be found in hotels and rooming-houses, their opportunities for spreading infection are greatly increased. Three or four years ago, when immigration was at its height, this problem was not by any means an easy one to handle, and frequently the accommodation at the Vancouver General Hospital was taxed to its limit. As many of these cases developed a day or so after arrival in the city, it suggests that the patient—if an immigrant—must have had the particular disease in its early stages at the time of his examination by the Quarantine Officer prior to his entry into Canada, and I am of the opinion that the medical inspection of immigrants at the port of entry should be much more rigid and thorough.

I feel very strongly that this inspection should be carried out during the voyage—not by the physician employed by the transportation company, but by a Dominion Medical Inspector—and that special attention should be paid to tuberculosis, mental deficiency, and specific diseases. This is especially true with regard to tuberculosis, and it is brought home to us forcibly when we are compelled to provide for persons who have been in the country possibly only a few months.

In preparing some data for Dr. Peter Bryce, who is giving a paper in Ottawa at the annual meeting of the Canadian Public Health Association, I found that of 468 cases of tuberculosis reported to my department during the years 1914 and 1915, forty-nine were immigrants, none of whom had been in Canada more than two years and many only a few months. Under the quarantine regulations these persons should have been returned to the country from whence they came, but owing partly to the war and partly to the fact that there is no properly organized system for handling these cases, nothing was done and they were allowed to remain—a menace to our citizens and many of them becoming a charge on the community.

When the war is over this question of immigration will become a live one again, and it is time for us to prepare for it, making our laws more stringent and by enforcing those we already have, and not wait until we are compelled by pressure of circumstances to take action. We do not want disease-ridden people from other countries, for it is unfortunately true that we have more than sufficient of our own.

It seems to me that, looking at the question from a national standpoint, the foregoing is the first essential in the control of infectious diseases, and granting it would be possible by these means to prevent the entry of disease into the country, the question would then become one of eradication rather than control. In this no real progress can be made until the problem is approached in a much broader manner. At the present time every city and municipality makes its own by-laws, and either does or does not enforce them, as the case may be. Of what avail is it to have effective control of diseases in any city when they are allowed to rage unchecked on its very borders?

I feel very strongly that the only proper way to handle this problem, and indeed all public-health problems, is by centralizing the authority governing the question. I am of the opinion that there should be a Federal Minister, or Deputy Minister of Public Health, in order to properly govern immigration and inter-provincial relations. Each Province should also have a Minister, and public-health matters should be placed on a firmer basis and given the consideration which their importance warrants—free from politics and undue municipal influence. I have only touched very briefly upon this phase of the question, but would like very much to have it discussed freely.

Having now given you my main idea regarding the broad principles of the control of infectious diseases, we come to the method to be adopted in the particular city of municipality, and again I must crave your indulgence if I describe to you the procedure in vogue in my own department. In the first place, there must be ready and willing co-operation between the medical men and the Health Department, and I am glad to be able to relate that this very gratifying condition obtains in Vancouver. The doctors show a commendable readiness to notify the Fumigation Officer directly their diagnosis is made in the more serious diseases—and in the minor ones also—when they are found out. In addition to the doctor, the parents and the schools are required to notify my department of any cases of which they may have knowledge, so that while we may get three notices of the same case, we are almost sure to get one.

In almost every case of scarlet fever, diphtheria, and smallpox, the patient is removed to the hospital for treatment, and the house is placed under temporary quarantine and fumigated, the suspects or contacts being kept under observation until the incubation period of the particular disease has elapsed. When the patient remains at home the house is placarded with the name of the disease, and strict quarantine maintained until recovery, when thorough fumigation with formaldehyde is carried out and the clothing and bedding is disinfected by means of a steam sterilization.

No quarantine is imposed in the minor diseases, such as measles, whooping-cough, chicken-pox, etc., but children suffering from any such disease or living in a house where disease is present are rigidly excluded from school until all danger of imparting infection is passed, when a certificate is issued from my department permitting the principal of the school to readmit them.

Considerable attention is paid to the disinfection of school-rooms. The procedure I have adopted is the burning of all loose papers, etc., the washing of desks with some antiseptic solution, and the liberation of formaldehyde gas. There is, of course, considerable controversy as to the efficacy of this latter precaution. I am not prepared to go into the pros and cons of the matter from a prophylactic point of view, but we must remember that we are dealing with the public, who are never satisfied unless they can smell a disinfectant, and it is our duty to

satisfy them that every reasonable precaution has been taken. Personally, I am of the opinion that the essential details in all fumigation are plenty of soap and hot water and elbow-grease, the burning of all papers, rags, etc., and the use of limewash. This is the method upon which we place the most reliance.

To return for a moment to the subject of placarding houses: About two years ago the Provincial Board of Health instituted a system of placarding houses for the minor diseases, the placard bearing the name of the disease and warning all persons to keep away. I found that the effect of this was not what was intended, for people objected to having their houses labelled for measles or mumps, and the result was that the cases were not reported.

A great step forward in handling infectious diseases has just been effected by the setting-aside of observation wards at the Vancouver General Hospital. There is a large number of people in Vancouver living in hotels and rooming-houses, and a great influx on boats and trains, and frequently a case of sickness occurs amongst these people in which it is impossible to make a definite diagnosis offhand. This difficulty has had to be met in the past either by using private wards or by placing a whole ward under quarantine, which for obvious reasons was inconvenient and undesirable. To overcome this difficulty a number of small cubicles have been erected at the hospital in which doubtful cases may be segregated for observation until a diagnosis can be made, when they are removed to their proper ward and the cubicle disinfected.

With regard to diphtheria, we have now got the situation well in hand, and there is no valid reason why there should be a single death from the disease, provided the doctor is called in time. Free antitoxin is supplied by the city without any restriction whatever. The attending physician may, by giving a receipt to the City Druggist, obtain all he requires, and usually gives an injection as a precautionary measure, however doubtful the case, while awaiting the result of the bacteriological examination of the swab. Sterile swabs are also provided free of charge, and all the doctor has to do is to send the swab to the laboratory at the Vancouver General Hospital, where it is examined free. Everything is made as easy as possible, and the result is to be noticed in the very gratifying reduction in the number of cases and the percentage of deaths.

The Vancouver General Hospital has now established as a routine measure the taking of swabs from all children admitted, for whatever cause, and by this means eleven carriers of diphtheria were discovered during 1916. Altogether twenty carriers were found in the city during that year, and isolated until recovery—none of them showing the usual clinical symptoms of the disease.

I regret that we have not been as successful in the handling of measles and whooping-cough as with diphtheria. It is an unfortunate fact that few parents realize the seriousness of these diseases and their complications in young children. During the year 1916 there were thirty-seven deaths from broncho-pneumonia amongst children under the age of one year in Vancouver, and there is little doubt that many of them were the result of insufficient care during measles or whooping-cough. These two diseases, which are so lightly regarded among the laity, are responsible for 80 per cent. of the deaths from acute infectious diseases in this city, and yet people wilfully and criminally expose their babies to measles, though possibly not whooping-cough, in order to save themselves a little trouble later on.

Typhoid fever, of course, depends very largely upon the water-supply and sanitary arrangements in vogue in the particular community. In Vancouver we have a water-supply which is the equal of if not superior to that of any other city in the world, and since 1910, when the problem of sewering the entire city was undertaken in a systematic manner, the number of cases of typhoid has shown a steady reduction year by year. In 1910 there were 265 cases reported and twenty-seven deaths; in 1916 there were thirty cases reported and three deaths, and as all but six of these were traced to outside sources, it may be said the typhoid-fever is non-existent in this city; and it may be safe to deduce that this happy state of affairs is due to the vast improvement effected in general sanitary conditions.

On the subject of tuberculosis I hope to say a few words at the conclusion of Dr. Vrooman's paper. The eradication of this disease is one of the greatest tasks that has yet been faced by public-health authorities, and it is one which is becoming more and more important every year. In Vancouver in 1914 the death-rate from this disease was 1.1 per 1,000 of population; in 1915 it was 1.35; while in 1916 it rose to 1.57, an increase of over 50 per cent. in three years. Something must be done soon. More drastic legislation, if necessary, must be passed by the Govern-

ment. We must be prepared to spend money, and in addition there must be a greater awakening on the part of the public to the dangers of the situation.

I have not touched on poliomyelitis, as that is the subject of a separate paper by Dr. Carder, who has had exceptional opportunities for studying the disease; neither have I dealt with venereal diseases, deeming that it would not properly come within the scope of a paper of this nature, being too large and important a matter to be dismissed with a few sentences.

In conclusion, I have tried to bring forward in a concise manner the salient points in the control of infectious diseases, not so much as one who speaks with authority, but rather in the hope that my remarks may induce some helpful discussion, for I am of the opinion that the resultant good would be far more lasting and beneficial to all than the reading of a purely academic paper, however learned or profound; and I venture to say that all of us who hold public office are glad of an opportunity to have a good grumble at things as they are and air our views as to how they should be.

There are times when the problems which confront a Medical Health Officer loom strangely large, and he feels that he is standing alone and is frequently unable to get the support even of his committee, which he feels he has a right to, and an occasion like this is an opportunity not to be missed.

There are many other matters of great importance in connection with public-health work that I would be glad to speak upon, but as they do not come within the scope of this paper I will bring my remarks to a close.

DISCUSSION ON DR. UNDERHILL'S PAPER.

Dr. A. G. Price (Victoria): Coming from the smaller city, the Capital City on the Island, I take the liberty of opening this discussion on infectious diseases, following the paper by my friend Dr. Underhill. I would like to have heard Dr. Underhill for another half-hour, because he has had vast experience in Vancouver in the suppression of epidemic diseases. I am only a short time in office in Victoria, but I happen to have come in at a time when there was a severe epidemic of measles, which took all of my exertions to suppress—I leave it to you with what success.

Dr. Underhill mentioned they did not quarantine for measles or chicken-pox. Well, in cases of very prevalent epidemic, I thought it better to step in and quarantine, as measles is not a case you can treat in isolation hospitals when it comes to 2,000 or 3,000 cases such as we had in Victoria, and we have to have it attended to, of course, in the houses.

I have had some experience in England in an epidemic of measles. One municipality would have them quarantined and another would not. Where they were quarantined there were no deaths, and where they did not quarantine there were six deaths. I found that where they were not quarantined the mothers allowed their children to go out on the street at the end of one week or so, and the result was bronchial pneumonia. We keep them in sixteen days in Victoria from the commencement of the rash. The result was that out of about 2,500 cases we went through almost without a death until at the very end two very small children under one year of age died of pneumonia. The weather was very severe at the time, and I put down the non-fatality of the epidemic to the harshness of our quarantine, because we kept the children in and the Inspectors went down to see that the parents complied with the order.

While the disease is a minor one, the sequel is severe in the case of chicken-pox. I think it ought to be notified, because there is such a danger among parents of mistaking a case of smallpox for chicken-pox. I tell you a case in point. We had a case of smallpox last March in Victoria. The lady who developed it was at a hotel in Victoria. We traced it from Tacoma within the period of incubation; we communicated with Tacoma and found a great deal of chicken-pox prevalent, but no smallpox. I have since seen the Health Officer in Tacoma, and found that there was a considerable amount of smallpox there since then. Were some of these cases smallpox? A very mild case of smallpox may be mistaken for chickenpox, and for that reason I would advocate that it be notified.

There was a case only a month ago in Victoria. I watched the patient in the Isolation Hospital and it turned out to be chicken-pox. Then I had the history of that. We had the case stopped in the Quarantine Station, but they allowed, against my protest, seventy-five steerage passengers to land at Victoria off that boat. I did all I could to prevent it, but it was left in the hands of the Dominion authorities. This happened to be a very severe case of chicken-pox; but I think measles and chicken-pox should be notifiable.

I was glad to hear Dr. Underhill mention diphtheria as being a disease of less severity than it used to be. I remember a friend of mine lost three children in one week from this disease. We have had a good many cases of diphtheria this year in Victoria, but no deaths in the hospital, with the exception of one Chinese who was found in Chinese quarters in an advanced stage and who died a few minutes after being brought to the hospital.

In that case we always take the house and quarantine and thoroughly disinfect it; have the walls whitewashed or limewashed down to prevent the spread. I am glad to say now we have no infectious diseases of any kind in Victoria. Of course, we have some cases of tuberculosis, but no acute infectious diseases at present; and I hope and trust, to come back to the vaccination question, that we will have vaccination and will not have this terrible epidemic of smallpox which, according to Dr. Underhill, we are in danger of having.

Dr. Vrooman (Tranquille Sanatorium): I think Dr. Underhill's paper calls for congratulation to him on the report he gives on the health situation in the City of Vancouver, and the fact that such a disease as typhoid has been reduced to a minimum, and other diseases to such a small number that they can be controlled so well. There are one or two points that I would like to touch upon in Dr. Underhill's paper.

Dr. Underhill stated that about 10 per cent. of the arrivals in Canada were sufferers from tuberculosis. My own figures show a little higher proportion. I find 10 per cent. of the admissions to the sanatorium are people who have been in Canada one year or less; 15 or 18 per cent., two years or less. These people had come to Canada for their health, most of them giving a history of tuberculosis in England or the Old Country. The only way that can be controlled is by following out a scheme such as Dr. Underhill outlined that these immigrants should be examined on shipboard or before leaving England.

Dr. Montezambert several years ago advocated that immigrants to this country should be examined before leaving the Old Country by appointees of the Immigration Department to see that they are not suffering from chronic infectious diseases, such as tuberculosis in particular. After the war there will be an influx of people to take care of, and practically all such cases will come to British Columbia because of the climate.

Another important point has reference to notification of tuberculosis. It is not notified. The reason for that is partly apathy on the part of the medical profession and sympathy for the patients. Dr. Underhill will agree with me that he is notified about a number of deaths in Vancouver in a year. I notify him of any patients arriving, any advanced cases at the sanatorium, but there are many cases not notified by any medical practitioner. That applies also to Victoria. This point should be considered and provision should be made to notify open cases of tuberculosis. From a health point of view it is the open cases we are concerned in—not from a treatment point of view, but from a health point of view. It is quite true we have not adequate accommodation to look after them, but you cannot even keep track of them unless you know, and I have followed the history of some of these cases and learned how they moved around unknown to the Health Department, and it should be strongly emphasized that to control tuberculosis it must be notified to the Health Officer, because the medical profession in this regard are careless.

Mr. Biker: I am very much interested in this question. I have been in a great measure in touch with the medical faculty in England and they have a great idea of the climate of British Columbia. The medical men in England are exploiting it against us, and if the percentage is 10 per cent. of the cases that arise we are just treating that number here at our own expense.

Another point struck me; that is in regard to smallpox and chicken-pox. It is a matter of opinion regarding whether it is smallpox or chicken-pox. The Medical Health Officer of the district should be supported and not ridiculed. The patient should be protected, but we have to protect the public health, and to this end the Health Officer should be supported.

Dr. Hepworth: There is one point I was interested in—that is, if one child in a family takes measles, should the rest of the family, or the children who have already had measles, be kept at home? Supposing there is a family of six children, five have had measles, and one has them, are we to keep the rest out of school?

I have had a fair amount of experience in these epidemics, and I find the disease spreads before they know they have got it. Measles will spread before the rash is developed. I have taken the stand that if there are four or five children, three of whom have had it and two have not, I have kept at home those who have not had it and allowed the others to go to

school. Am I right or wrong? There is one thing about measles; I don't pay much attention to them; they are not reported, anyway.

About tuberculosis: I want to hear Dr. Vrooman's paper to-morrow. I have had dozens of people who do not feel well, and if I take their temperature and find it 99½ for three days, that is all I want. If he has closed tuberculosis you let him out, but it may open up in a week after he gets into the country. You have to watch four or five days; no doctor living can make a diagnosis of closed tuberculosis in one day. I had a case the other day where one fellow said he could hear something and another did not; we found enlarged glands. He has tuberculosis that may open up at any time. This tuberculosis is rather a big question, I think. We had two cases of tubercular meningitis this spring; they died; and we had three or four other cases of tuberculosis. The trouble is most patients will not allow you to do what you want to do. If you want to take their temperature every three or four hours for three days, they say "No"; and if you do not diagnose the case right away they go to some one else.

Then there is the question of infectious diarrhœa. I did not hear the question brought up, but I would like to give a slight history of it. I have been eight years in Steveston as Health Officer, and I think I lost five cases of whatever you like to call it; I call it acute intestinal infection. This year three deaths; sick in the morning and dead at night—lasted about six hours, or perhaps a little longer. There ought to be some method of dealing with this. Who is going to control it? Suppose your municipality will not help you, who is going to do it? I can get no help where I have been. This is the first year they have not cleaned out a ditch, and there were three deaths from this disease, and only three deaths in eight years before. A boy took sick one morning in one house, and I was sent for at 9 o'clock at night and he died at 11. Another boy in the same house got sick and lived. A baby got sick with it a short distance away; two others got sick and one died; two others got sick and got well. How are you going to control it? It seems to me a pretty hard thing to control and there ought to be some method of doing it. To me it has been one of the worst bugbears I have had.

Dr. Petersky: Dr. Hepworth has brought up a certain question that I have had in mind, but didn't know where I was going to get it in, and I think it comes under infectious diseases; that is the difficulty of carrying out the control of infectious diseases in the country. You who are in the city have the people trained and the teachers trained, but it is different in the country. You go in there and attempt to interfere with what they have been doing for forty years. The Health Officers are unfortunately dependent on the police of the Attorney-General's Department, who act as sanitary officials. If the doctors cannot do anything the police never do anything. They seldom do anything, even if the doctor wants them to. Now, the district I am in at present, the police officials are paid $75 a month, and it is usually given to a returned soldier. If he finds out he can get $150 as a brakesman he resigns, and we don't try to check them up much for fear they will resign.

I think measles should be quarantined. I think anything should be quarantined that is infectious, and if it were in my power even scabies would be quarantined. The last place I was in I got the people trained, but in this place there is no training done yet. I think the cities are very fortunate; they have Health Inspectors of their own; and all they have to do is tell the Inspector and he can call a man up. If I do that, why I am in quite a practice there. I think the Health Officer should be a civil servant, independent of any private income. I think that is a weak point in this Province. He should be given a living wage so that he would not have to practise, and he could look after a larger territory and things could be done properly. When I left the last place I was in I registered a solemn vow that I would never be a Health Officer again. Unfortunately, or fortunately—I don't know which—Dr. Young prevailed upon me to take it again, and now I suppose I will get into a jackpot; but I agree with Dr. Hepworth that in these country places where the people do not back you up it is pretty difficult. I think it is an educational campaign in sanitation as well. People are more concerned with commercial life, and we have to depend on the commercial part of it, and that is where the whole trouble lies.

The Chairman: The discussion is taking a little bit of a side-track; will you kindly, as far as possible, keep the discussion to the lines of the papers?

Dr. Hepworth: I want to make one point: Our police officials are *ex-officio* Sanitary Inspectors; they are more interested in collecting a road-tax or a poll-tax to make their department pay. I think the Health Department and the Police Department should be segregated,

because they will not see a dead cow in a ditch 5 yards away, but they can see anything half a mile away if they are going to collect a fine. I cannot get any sanitary work done in my department.

Dr. Young: No doubt in the matter of infectious diseases the Medical Health Officers have been handicapped from the fact that there is no adequate machinery in the different municipalities in the Province. We have endeavoured to overcome this as far as possible. The millennium may come some day, and we will then have in each district a Medical Health Officer enjoying a generous salary; but with the population of 400,000, which is a very large estimate, spread over 400,000 square miles, the Government cannot be expected to reach as yet the millennium in medical-health matters. We are doing the best we can, and regarding Dr. Petersky's complaint and Dr. Hepworth's complaint about the police, they have a very large territory to cover; but I have made arrangements this year with the Attorney-General's Department for a very definite co-operation in health matters by the Provincial constables. The sanitary regulations have been consolidated and printed, and copies are being furnished to the Provincial police, who are requested to act as sanitary officers and take an active part in the work, and not force the Medical Health Officer to be prosecutor as well as Medical Officer. Forms will be provided for them to fill out, and the policemen can make reports to the Provincial Board of Health Office in Victoria, and we can have co-operation through the headquarters of the Health Department with the Medical Health Officers. We hope to relieve the resident Medical Health Officer of the onus and responsibility attached to a man in private practice where the duty conflicts with his personal interests.

The Chairman: I am glad that relief is going to be afforded; we will be glad to have further discussion along the lines of the paper on the control of infectious diseases.

Dr. Isabel Arthur: There is one question I would like to ask. In our neighbourhood there is a sanatorium and these patients come into Nelson from time to time and sleep in the hotels, and there are a great many complaints about this. I would like to know whether this is the right thing for them to do.

With regard to the other infectious diseases, such as measles, mumps, chicken-pox, and whooping-cough, I think only the patient should be quarantined. It is too hard to quarantine the whole family for these diseases, and it is not necessary, and the Provincial Board of Health has sent out notices that children from these families may be allowed to go to school.

In many of these diseases we have used moving-picture slides, asking the people from the screen that children with these diseases should not be allowed in these shows, and this has been found very efficient.

Dr. McEwen (Medical Health Officer, New Westminster): With regard to the question of tuberculosis, where a death has been reported to the Health Department, what precautions are taken as to disinfection or what methods are taken to prevent the spread from that case?

Dr. Stanier (Victoria): There are two points Dr. Underhill raised: One is the case of infectious diseases in transit. The cases that come in here most generally are from the Old Country, landing at Halifax. There are not many cases coming through Williams Head. They continue at the different cities until they land in British Columbia, and as they cannot go any farther without jumping into the water they remain here. Unless these cases are stopped before they get to Halifax, and there is a more systematic inspection, we are going to have them here. We can look after our own local infectious diseases, except tuberculosis. In Victoria there is one place for tuberculosis, and that is Chinatown. There is nothing done there for closed tuberculosis. I think about 50 per cent. of the Chinese are tubercular, and I think 90 per cent. of the cases in Victoria originate in Chinatown. Unless we can get at the root of that field we cannot eradicate our local tuberculosis.

Dr. Underhill (replies to discussion): Dr. Hepworth asked me some questions. There are some of the points that I certainly am not going to answer. I think possibly Dr. Hepworth and Dr. Petersky have not realized the duties of Medical Health Officers at all. One thing is sure, when a medical man is in doubt or does not want to make a diagnosis he sends for the Medical Health Officer, and it is up to the Medical Health Officer to make a bluff; if he says it is smallpox, it is smallpox; it doesn't matter whether it is or not. You have to take this responsibility on yourself and decide what has to be done and to do the best you can.

With regard to the outbreak of measles in Victoria, that is a unique situation. If you can control 1,000 cases of measles, you do mighty well, for these cases are not all reported—make no mistake about that.

Regarding chicken-pox, this is quarantinable, but unless smallpox is prevalent we do not necessarily placard for it.

Regarding tuberculosis, Dr. Vrooman is going to tell us how to diagnose tuberculosis to-morrow; I don't know anything about that myself, but he told me in confidence he was going to tell us how to do it. Regarding deaths from tuberculosis, I would sooner disinfect for tuberculosis than for almost any other disease, and every precaution is being taken regarding the house and everything sterilized if possible.

Chinatown raises a big question. That is one black spot in Vancouver. We have a Chinese hospital where all the Chinese tuberculosis cases go that belongs to Chinatown. I think we have much more air and more windows in Chinatown here than in most places, but it needs daily inspection.

MEDICAL INSPECTION OF SCHOOLS.

By F. W. BRYDONE-JACK, M.D., C.M., CHIEF MEDICAL INSPECTOR OF SCHOOLS, VANCOUVER, B.C.

The present terrible war brings home to us with great clearness the necessity of the conservation of the life and the resources of our nation. A nation's place in the world is determined by the combination of virility, intelligence, and the numbers of its people. This combination can be attained in varying degrees, depending on the extent to which a nation is willing to adopt and enforce the principles of hygiene.

The department of hygiene with which we are particularly interested is that dealing with the child. We recognize its outstanding importance, for we know the child is the source of the nation's man-power, and that upon a healthy childhood depends the health, vigour, and mental alertness of the adult.

The following are a few figures bearing on health: In Vancouver in 1916, 61 babies in every 1,000 died before reaching the age of one year. Nine and one-tenth per cent. died from acute or chronic indigestion, due to improper feeding. In 1916, 2,680 children were born. Therefore Vancouver alone needlessly lost 243 babies during that one year. Germany, in 1915, recognizing the importance of babies, enforced a comprehensive system of infant-care. The mother received antenatal care. An adequate supply of milk was assured for the child from birth to six years of age. Germany estimates that she has saved sufficient babies that by 1921 there will be more babies in that country than there would have been without a war, and she has obtained that result in spite of the fact that in many parts of the country there has been a fall of 50 per cent. in the birth-rate.

Medical inspection of schools was adopted in Great Britain in 1907, in consequence of public opinion following the alarming percentage of unfits among the men attempting to enlist at the time of the South African war. There has been considerable improvement since school medical inspection was inaugurated, as the following figures show:—

NUMBER OF RECRUITS REJECTED FOR THE BRITISH ARMY PER 1,000.

1909	299.04
1910	295.42
1911	246.50
1912	223.77

The figures for this great war are as yet unobtainable, but the corresponding figures are stated to be much better.

A scheme of child hygiene should be comprehensive. It should concern itself with the prenatal care of the mother and the care of the child from birth to adult life.

The child-life may be divided into three periods:—

(1.) From birth to two years of age—infancy.

(2.) From two to five years of age—the pre-school age.

(3.) From six to eighteen years of age—the school age.

There is no hard-and-fast line between these ages, and it would seem foolish to have three separate organizations each dealing with but one period of the child's life, and yet this has been the case in many cities, resulting in much confusion and overlapping.

Generally, throughout Great Britain, one authority—the education authority—has entire control of child hygiene. In New York City the Bureau of Child Hygiene, a division of the Board of Health, exercises a similar control. The same control by the Board of Health is exercised in Montreal, and since July 1st of this year has been adopted in Toronto. Previously in Toronto the Board of Health did the prenatal work and the work among infants, while the Board of Education had charge of the medical inspection of school-children. Much has been written for and against the control of medical inspection of school-children by the education authorities. To me it seems that where there is a well-organized and a comprehensive organization for child hygiene one authority should have complete control, but where health organization is difficult or impossible to complete, as in small towns, then a separate control of the medical inspection of school-children by the education authority may be vastly superior in results.

In British Columbia the control of medical inspection of schools is vested in the Provincial Board of Health, but it has been made the duty of the local education authority—the Board of School Trustees—to enforce the "Schools Health Inspection Act" and to provide funds, the staff, and the equipment. The School Board is therefore particularly interested in that phase of child hygiene which applies to the school-child. Usually this work has been called "school medical inspection." This title expresses very well the results so far obtained. From now on what is required is not school medical inspection, but school medical service. Such a service is concerned with the detection of physical defects and the more important work, that of obtaining treatment for the conditions found. The control of contagious and infectious disease, the hygiene of the home, the proper heating, lighting, ventilation, and sanitation of the school, adjustable seats, the curriculum, good blackboards, proper size reading-type, character of the writing materials, school lunches, regular exercises, etc., are factors which the medical service must have constantly in mind in order to prevent as far as possible the child's acquisition of disease or defects in the grind for an education.

A thorough physical examination is of the utmost importance. A great deal of criticism and dissatisfaction has been caused by the extremely superficial manner in which children have been examined in many American and Canadian cities. For instance, in Toronto the law called for a thorough examination, including the heart and lungs, but insisted that no clothing could be loosened without first obtaining the consent of the parent. Such consent was very rarely asked, and as a result 95 per cent. of children were only examined in regard to eyesight, teeth, and tonsils. No wonder people could not understand why the Medical Inspector did not find the crooked back, the deformed arm or leg, the weak heart, or the lung-trouble. New York recognized this weakness and has for the last two years been inviting parents and attempting to thoroughly examine children. This thorough examination is not done every year, but only in the first, third, and sixth school-year. In the other years it is of vital importance to have a specially trained nurse test the eyesight, see the teeth and throats, and estimate the general health of every child, so that a child needing attention may be referred to the school doctor for examination without delay. In this the interest and co-operation of the teacher is essential, because it is the teacher's opportunity to be with the child day in and day out, being thereby enabled to detect immediately any child's departure from its normal average health. Toronto is to inaugurate such a system with the opening of the schools in September. There is no reason to fear the results, for this system has been working very satisfactorily in Great Britain since 1907. In Japan also the thorough physical examination is recognized as the most satisfactory.

N.B.—In regard to the thoroughness of the physical examination, Vancouver was the pioneer in North America and still holds first place.

In making the physical examination the following procedure should be followed:—

(1.) The parent should be invited at a definite time.

(2.) The child should be stripped to the waist in privacy and stockings and shoes removed. With female children a towel should be draped over the shoulders and chest for the sake of modesty.

(3.) A nurse should always be present—to prepare the child, assist in the examination, and to make notes.

Under these circumstances when a defect is found its nature can be very easily demonstrated to the parent. It can be found at once what is possible in regard to treatment, and arrangements can be made for the medical service to obtain treatment for the child if the parents are poor.

If it is impossible for the parent to be present at the examination, then a sealed notice of the defects found should be sent. The nurse should visit the home within two weeks, and in any case it should be the aim of the nursing department to know within a month what steps the parents have taken in regard to treatment, though this time is often too short when a nursing staff is small as compared to the many duties it is expected to perform.

An alteration in the school curriculum will be the treatment required for children suffering from certain defects. These children will be grouped in special classes called auxiliary classes.

Such a class as the open-air class is required for the thin, weak, sickly, and the pre-tuberculous children. An ordinary class-room with all the windows open, with movable desks and folding cots, is all that is required. Sometimes the flat roofs of schools are utilized when the accommodation in the school is limited. Some of these rooms are heated, some are not. The children must wear special clothing and must have an adequate rest period. The children improve more rapidly in health and weight when a good lunch is served. For tuberculous children open-air classes should be formed in sanatoria. A child with open tuberculosis should not be permitted to attend the open-air class intended for ill-nourished and anæmic children.

Auxiliary classes are also required for the deaf, the blind, the semi-blind, children with speech defect, and for crippled children. It is estimated that 2.8 per cent. of the children of St. Louis have speech defects. Boston is tackling this problem in a sensible way, having what are called speech-improvement classes. During the past year 333 children were collected from eighteen school districts and instruction was given by five teachers to nineteen different groups of children. The improvement in articulation is most pronounced. Another interesting class in Boston is that for semi-blind children. Twenty-two children having a vision of not less than one-tenth normal were gathered together and receive special instruction. The type of the books is large and most of the teaching is oral. Seven classes were formed from the twenty-two, though most of the instruction is necessarily individual.

Another type of auxiliary class is that for mentally retarded children. At least one child in every hundred is so affected. The best results are obtained by attempting to give an education to those only that may profit by it. Children up to the age of ten or twelve may be taught in mixed classes in local districts, but afterwards the boys and girls should go to separate classes where more time can be given to domestic science and manual training. Mixed classes of the older mentally retarded children are not as easily disciplined nor do they progress as rapidly as the separate classes. Boston has fifty-five classes with an enrolment of 815; the older girls are sent to a six-room centre which forms a higher school; the older boys are treated similarly. Transportation is provided by the city.

In regard to treatment of physical defects, there are at the present time three methods usually employed—by private physician, when the parent can afford it, and when not, by school clinics, and hospitals.

Let us examine first the method followed in England to obtain treatment for school-children. The following extracts from the 1914 Report of the Medical Officer of the Board of Education for that country will give a clear idea of what is being accomplished:—

"There is no more hopeful feature of the work of the school medical service than the fact that many of the most fruitful activities are of the nature of voluntary undertakings on the part of local education authorities. The Board's system of medical grants, graduated according to the efficiency of the arrangements made, has done much to reinforce local enterprise and lighten the burden of local expenditure. Under the 'Education (Administrative Provisions) Act, 1907,' the initiative in regard to treatment schemes remains with the local education authority, and a considerable proportion of the cost is borne by the local ratepayer.

"In 1914, out of 317 education areas in England, 266 had some form of treatment in school clinics. Treatment was provided for:—

(1.) Minor ailments in 204 clinics.
(2.) Dental defects in 130 clinics.
(3.) Defective vision in 195
(4.) Provision of spectacles in 165 } refraction-work clinics.
(5.) Enlarged tonsils and adenoids in 83 clinics.
(6.) Ringworm (X-ray) in 68 clinics.

"In 1914 there were 179 school clinics.

"The school clinic still maintains its position as the most generally suitable institution for dealing with children suffering from remedial defects, for the following reasons:—

(1.) There are the advantages of complete control.
(2.) Arrangements are easily made to suit the convenience of doctors, teachers, and children.
(3.) Complete supervision of the treatment in all branches is possible.
(4.) Clinics can be held in positions easily accessible.
(5.) Follow-up work is readily arranged and accomplished.

"*Clinics for Minor Ailments.*—The treatment is simple; it can often be done by a nurse acting under medical direction. Cases do better as they can be treated in school more frequently than they are at home. In 1912 (Warrington), 1,490 children lost 57,793 attendances owing to minor ailments, an average loss of 38.8 attendances. In 1914, on account of daily treatment, the average loss was reduced to 27.2.

"The treatment of these conditions is essentially the work of the school nurse. The unsuitability of hospitals for carrying out treatment of this nature is generally recognized; the staff have not the time to devote to the supervision that is required, nor to the daily routine of treatment. Neither can the parents of the class, for the benefit of which these institutions are supposed to exist, afford the time or the means entailed in paying repeated visits to the hospital.

"*Clinics for Defective Vision.*—Ten per cent. of children require treatment for defective vision. One hundred and ninety-five authorities are having clinics, and in addition to the prescribing of spectacles, have entered into contracts for the provision of spectacles at cheap rates.

Work done by part-time ophthalmic surgeons	98
Work done by whole-time ophthalmic surgeons	4
Work done by staff of school medical service	74
Work done by contributions to hospitals	37
Spectacles provided by authorities	165

"There is dental treatment in 130 education areas. There are 200 dentists, fifty-one being full time, sufficient to treat 375,000 children.

"*Clinics for Enlarged Tonsils and Adenoids.*—Of all the remediable defects of school-life, enlarged tonsils and adenoids are the most neglected and show the lowest proportion to have received adequate treatment, in spite of their prevalence and their marked disabling effect on health. The number of authorities making provision for operative treatment is small, only eighty-three. The reason for this is that in many areas the work is undertaken by voluntary hospitals without charge.

Number of authorities	83
Work done by doctors not on school staff	24
Work done by school medical staff	7
Work done by hospital staff	57
Work done at school clinics	30

"*Care Committees.*—The development of the scheme of treatment has involved a corresponding increase in the work of following up. Every large school or group of schools has a School Care Committee, and the work of those committees is co-ordinated by a staff of paid organizers employed by the London County Council. Care Committees are also concerned with the provision of meals and the after-care of children, with the work of juvenile employment, and with attendance at evening classes. Leavers are interviewed as far as possible and endeavours are made to find suitable employment.

"RESULTS OF THE WORK OF THE LONDON SCHOOL MEDICAL SERVICE, 1914.

"During the year 84,500 reinspections were made. Of all the children found defective, 50 per cent. were treated by the time the first reinspection was held. Of those children suffering from

ailments for which the Council had made special provision, 62 per cent. of the cases were dealt with under the Council's scheme.

	Treated and completely cured.	Cured naturally or without Treatment.	Treated but not completely cured.	Not treated and requiring Treatment.
Refraction	56.1	6.8	12.2	24.9
Ear, nose, and throat	53.3	17.7	4.4	24.8
Teeth	48.9	10.2	5.9	35.0
All cases	51.3	15.3	8.6	24.8

"In 1912 only 39 per cent. were treated under the Council's scheme.

"The following table shows the percentage of children obtaining treatment from (A) the family physician; (B) under the Council's scheme; (C) at other hospitals or institutions:—

	(A.) Private Doctor.	(B.) Under Council's Scheme.	(C.) At other Hospitals and Institutions.
Refraction	3.1	74.3	22.6
Minor ailments	17.6	50.7	31.7
Ear, nose, and throat	7.4	58.9	33.7
Dental defect	21.2	56.1	22.7
Other ailments	27.1	6.2	66.7
Totals	13.6	56.2	30.2

"The high percentage (74.3 of the whole) who get their refraction done under the Council's scheme shows what a need has been met by the facilities for treatment arranged by the Council; very few cases needing refraction (3.1 per cent.) or cases of operation for adenoids and tonsils (7.4 per cent.) are able to arrange for treatment privately.

"The medical treatment scheme adopted by the London County Council combines the advantages of a hospital service and a school-clinic service. During 1914, 294,026 children were examined and 101,432 were found to require treatment. In March, 1915, the education authority contributed to 12 hospitals, providing for 26,184 children, and to 30 other forms of institution, providing for 72,012 children, the total number of centres being 42, providing for 98,996 children.

"Under these agreements the Council pays to the hospital or institution the sum of £50 a year for each doctor, surgeon, or anæsthetic working on one half-day a week, and *pro rata* for each half-day a week so worked. In addition, a capitation payment is made of 2s. for each major ailment treated in respect of eye, ear, nose, throat, and teeth, and for X-ray treatment of ringworm a capitation fee of 7s. is paid. A dentist working half-time on five sessions a week is paid £200 a year.

"There are three types of centres:—

"(1.) *Hospitals.*—The time of the clinics is arranged to suit the convenience of the hospital. Doctors and assistants are appointed by and are under the control of the Hospital Board and devote the whole of the time for which they are paid by the Council to the work of dealing with the children referred by the Council.

"(2.) Centres provided by Medical Practitioners' Committees, who provide and maintain the centre. These centres are under the administrative control of the Council. The medical staff are selected by the Council from names supplied by the Medical Practitioners' Committee and are paid for the time given to the clinic. The Council sees to the supply of patients and to the following-up of those under treatment. It also equips the centre with the necessary apparatus. A nurse employed in the Public Health Department of the Council is provided to attend the clinic and to assist the doctors in the treatment of refraction cases, ringworm cases, and ear, nose, and throat cases requiring operation."

Medical Treatment in New York.

New York has had medical inspection since 1897. It was found that only 6 per cent. of physically defective children obtained treatment by the use of the postal-card notification system. By the appointment of school nurses for follow-up work in the homes in 1908 it was possible in 1909 to have 83 per cent. of the defects treated. It was felt by the Bureau of Child Hygiene that the test of the value of school medical inspection was the character and the results of the treatment obtained by the children.

In order that the existing need for more facilities for treating the children might be met, and that the character of treatment given and the adequacy of results might be under control, the department obtained in its 1912 budget funds for the establishment of clinics under the Bureau of Child Hygiene, exclusively for the treatment of school-children. Nineteen clinics were formed for nose, eye, ear, and throat service, for refraction, for dental work, and for contagious eye-diseases. At five of these clinics operations for adenoids and tonsils are performed. Operative cases are kept for twenty-four hours and a list of doctors on call is kept handy in case any untoward symptoms are noted. The clinics are open daily from 1.30 to 5 p.m., except Saturdays, when they are open from 9 a.m. till noon. Nose and throat operations are performed in the morning from 10 a.m. to 1 p.m.

Many of the defects from which the school-child suffers should have been prevented or detected and treated before entry to school. It is felt in England, in New York, and in Toronto that the best and the most logical way of reducing the number of school-children with physical defects is to examine them and treat them in the pre-school age. Toronto now has twenty-two child-welfare centres at which this examination for the pre-school child is done, in addition to the usual infant and milk depot work. New York maintains fifty-nine such centres and Montreal twenty-eight. It is estimated that one child-welfare centre is required for every 20,000 people. As a rule, a doctor attends a centre for a half-day once a week. The centres are conducted in police stations, Y.M.C.A.'s, Y.W.C.A.'s, and in settlement houses and in schools. Inasmuch as the public already own the school buildings, and as a school building is the centre of a district, it has been suggested that schools should be used for the child-welfare centres. This could easily be arranged on Saturday mornings. It seems that more and more responsibility is being given to education bodies. This is not surprising, for we now appreciate that education does not simply consist in teaching the school-child the three R's, but it includes the education of people of every age in everything which can improve our national well being—truly an enormous task.

In the preceding pages I have endeavoured to give an idea of the important features of a school medical service. We in British Columbia are young in the work and there is much that we will have to develop. We have made a good start, however, and it is my earnest hope that British Columbia will maintain the lead she has set Canada.

Discussion on Dr. Brydone-Jack's Paper.

The Chairman: This is a very important phase of work, and in order to have it more fully discussed there were three asked to prepare discussions. I will ask Dr. Isabel Arthur, of Nelson, to open the discussion.

Dr. Isabel Arthur: I was much pleased to know what Dr. Brydone-Jack said about treatment. The treatment is the main point of medical inspection. There is not much use in sending notes unless they can be followed up by treatment. That is the reason medical inspection does not work out the way we hoped it would. This is being done in the large centres in the States, and in small towns and rural districts of 6,000 and 7,000 people there is no equipment in the schools and no treatment given. It very often is not done at all, and medical inspection therefore does not get the desired results.

The Medical Inspectors in the rural districts are usually physicians who have other work to do, and they do not give up their time especially to that work. They do not get enough remuneration and do not spend their time. They have no nurse to help them and the remuneration is so small they cannot take the time to do this thoroughly. That is where our medical inspection falls down, and I hope some time to see medical inspection under the Government and Medical Inspectors paid to give up their whole time to medical inspection of schools; then and only then we will have good results from this work.

Dr. E. H. McEwen (Medical Inspector of Schools, New Westminster): Mr. Chairman, Ladies and Gentlemen,—I feel very much like the man who never made a public speech before, and when he was asked to make one he had a friend prepare it for him. Through some mischance he did not get time to memorize it and so he had some notes. When he started to deliver his speech, he said: "Ladies and Gentlemen,—Of course, this is entirely extemporaneous; of course, you will understand it is entirely an extemporaneous speech. Hang it, I don't know what to say next, because I can't find the place." So if I cannot find the place in my notes I know you will forgive me.

I was asked by Dr. Young to take part in this discussion, but being away from the city I did not receive it in time; I did not know until to-day what Dr. Brydone-Jack was going to say.

Now, in the first place, I would like to express publicly my thanks to Dr. Brydone-Jack for the assistance he has given me personally in the school-work since I have been in New Westminster. He has always been most obliging and has done his utmost to give me assistance in the work. I have been in the schools in New Westminster for the past six years, and, outside of one year before that, when I was in a country district, I had no experience whatever as to how to handle these things, and his assistance has been invaluable, and I want to publicly express my appreciation of that fact.

In the next place, with regard to country work, some have spoken of the difficulties in connection with that. One of the greatest blessings you can have in doing school-work is a good nurse; that is more than half the battle, and you haven't that blessing in the country at all, and you cannot keep in touch with the various patients that you run across. I think there should be some provision made by municipalities in general to appoint a nurse to give her whole time to country districts, and also some arrangements regarding her transportation from school to school before they can expect to get results from the country.

Now, in the city work, we find the nurse clinches all the suggestions made by the School Medical Inspector. In all cases where we send out notices they are followed up by our nurse, and she stays with them and persuades them, whether they wish to be persuaded or not, that it is best to have the case attended to. As a result, we have had a great many treatments on these suggestions.

With regard to the teachers, I have been greatly blessed, and have had good support from the teachers. Of course, there are exceptions; you cannot always find all of the lady teachers especially who will meet you in exactly the right way and follow up your suggestions as you make them, but, ordinarily speaking, they do the second time, at any rate, and I must say I have had good support from the teachers.

Now, with regard to this morning's paper, there was some mention made by Dr. Gillies that there were a number of cases sent to the asylums. The trouble, I believe, we must get to the bottom of in school-life and before school-life. We cannot teach the present generation—those in the asylums and those who should be—we cannot control them; but these children growing up, we have a certain amount of control over them, and that control should begin before the ordinary days of school-life.

I am in accord with Dr. Brydone-Jack that we do not begin early enough, and it should be under one authority, and school-work and the pre-school work in training the child. We see so many examples in school-work of those who should have been attended to before the child comes to school; it is pretty well on by the time we get them under our control. We should prepare that child for its future life. They come to school to learn the three R's; sometimes they get to high school and learn algebra and trigonometry, etc.; but the average child has finished his education before he reaches high school, and they are going to settle down and become fathers and mothers of future families. How many of these children know the first thing about themselves and the proper care of themselves, the proper care of the wife, or the husband, and the proper care of the children? I guarantee that a great proportion of them learn through a very bitter school, and I think we ought to try to accomplish the better education of the child-life on the lines of practical living. I think it is neglected in our present school-life.

Dr. Brydone-Jack has spoken about thorough examination in the schools. It is either that, or nothing; that is to say, I do not think it is much use giving a superficial examination of the chest and passing it up. I am sure Dr. Vrooman will bear me out in that, that there are few

cases of tuberculosis found in a superficial examination of school-children. I remember one case sent to Tranquille; we discovered a small patch in the chest, and then we found two or three places in the lung, and I discovered that after repeated examinations, and I only discovered about one-third of the whole thing. How much less could it have been discovered in a hurried examination of children in a school?

He has mentioned that it should not be "medical inspection," but "medical service." I think that is the crux of the whole question. We have started in a small way in New Westminster. The nurse occasionally gets stuck and asks me for help, but she practically handles the whole thing herself, and much practice is making perfect. She is doing a great deal of good in our city in a great many minor cases; ringworm, small cuts and bruises, and minor injuries are all handled in our school offices.

We hope to have a dental clinic established next year. We probably would have had it this year, only the money was not provided in the estimates, and it was left till after Christmas. We hope for great things after Christmas in starting our dental clinic.

Regarding tonsils and adenoids, it is all done by private physicians. We have followed up these cases particularly during the past few years. Parents have been visited, and the fact brought home to them that it was a necessary thing for the child that these cases should be attended to. In cases where they were absolutely destitute I have attended to several cases, and the result is we have quite a number of operating cases to the credit of the school-work.

That brings us to the backward children. The class of backward children has been greatly decreased by attention to that side. This is only one phase of the subject, but it is a very important one.

There is another difficulty, as Dr. Arthur mentioned, regarding thorough examination of the child. Most certainly, where the medical man has no medical nurse to assist in the dressing and undressing of the children he has his hands full, and a good many of us cannot manage it. I think it is almost impossible to give them a thorough examination, although it is a most desirable thing.

The Chairman: I hope we all appreciate the fact that we are here to learn and to educate. The Government has called together, or the Health Department, this Convention, and they wanted our experience, and our views—our difficulties as well as our successes—that they might better organize the work to improve the service. We have had a paper and discussion by those carrying on this work in the larger centres of our Province, but the work is going on in a lesser degree, as far as it is able to go on, in the smaller centres, and we would be glad to hear from any of those who are carrying on the work in the smaller centres.

Dr. Petersky: As a man who has had experience only in rural districts, I think the Convention has an idea now that I have only had difficulty in my work. I have not found great difficulty; I have gotten out of difficulty. I think this Convention is a place to bring difficulties to.

With regard to the schools, I mentioned the teachers were not quite what they should be. I have got through examinations and had the teachers act as nurses for me, and they were quite willing to do it, but you have to use a certain amount of tact. Once in a while you come across one you can't do anything with.

I want to take issue with Dr. Arthur on one point; I think she has said the money expended in country schools is wasted, practically, because there is no treatment. I find in my experience, particularly in dental work, and the eye, ear, nose, and throat, a certain percentage were attended to—not as promptly as in the cities, but the parents usually make trips to Vancouver or Victoria for other purposes, and take the youngster along and have it attended to at the same time. Usually I tell them if there is one man who can do it better than another. I think it is in the country where they attend to those things. You people who think you have all the cancer cases in the city, I would like to tell you that it is the country that acts as a feeder to the city. We are like a big railway company providing the passengers along the railway for the main line. Cases we cannot handle ourselves we send to the cities. We know the people better than you do in the cities, and sometimes the parents will apologize to me for not having these things attended to more promptly; but I know when I examine the children next year I find these teeth attended to, and probably other ones fixed up. Of course, some are not attended to at all. In the city you can get things done better and the teachers understand these points better, but we do not get the best teachers in the country because the salaries are not so good.

Dr. Isabel Arthur: I did not intend to say that money was wasted in the country schools, but that medical inspection could not be so efficient without following it up by treatment in every case. It is quite true many many children are treated from notices sent home. I find a large percentage of the children have been treated in these cases, but there is always a certain percentage of children who cannot be treated, whose parents have not the money to pay for the treatment, and if they cannot be given medical attention, the medical inspection cannot be as efficient as if it were carried further.

Dr. Brydone-Jack (replies to discussion): In regard to a certain amount of education on health matters in the schools, last year we had "little mother" classes conducted by the girls in Senior Fourth class. They received a course of instruction from about the first of April to the end of June. They were taught to look after babies and the general principles of feeding, and were given instructions such as would fit them to look after children to a certain extent when they grew up and became mothers.

There is some difficulty in rural districts as to examinations. That is why I emphasized having the parents present, because they could assist you and you could talk to them direct. The Victorian Order of Nurses will also assist when called up in medical-inspection work.

In regard to treatment, of course it is difficult here at the present time. In England they are having travelling dental clinics, travelling refraction clinics, rural school nurses, etc., and I think the Provincial Board of Health has that under consideration; it is simply a matter of time when they get it here.

The Chairman: Dr. E. B. Carder, of Vancouver, will now give his paper on "Poliomyelitis."

POLIOMYELITIS.

By Dr. E. D. Carder, Vancouver, B.C.

History.

In 1840 the first description of poliomyelitis as a definite entity was given by Heine, an orthopedic surgeon, in a monograph on the surgical aspect of paralytic conditions of the lower extremities in children, but containing a clear-cut description of the onset and acute stage.

In 1890 Medin published the first good clinical account of acute poliomyelitis based upon the extensive Swedish epidemic.

Smaller epidemics were reported from year to year, but no important additions to the existing knowledge of the disease were made until 1905, when Wickman, also studying Swedish epidemics, developed the epidemiology of the disease and its pathology, and described for the first time the abortive type. His exhaustive studies demonstrated conclusively the contagious nature of the disease. There remained, then, the problem of finding the infective agent.

In 1909 independent observers in Vienna, Paris, and New York succeeded in experimentally producing the disease in monkeys and in transferring it from one monkey to another. The infectious agent, according to Flexner, is a minute micro-organism which passes through the finest filter and can be demonstrated under the highest-powered microscope only, the difficulties attending its artificial cultivation and identification being such as to make useless the ordinary bacteriological tests for its detection. It resists freezing, is destroyed by temperature of 50 C., withstands glycerine and ½ per cent. carbolic, but destroyed by H_2O_2.

On the other hand, Rosenow, of Rochester, recently investigating a series of cases there and in New York, isolated a polymorphous streptococcus from the throat, tonsil, and central nervous system of poliomyelitis cases. This organism appeared to grow large or small, according to the medium used, even after passing through a Berkefeld filter. Using the organism in its large form, paralysis was consistently produced by intracerebral injections in rabbits and in monkeys. He suggested that the small filterable organism which has been generally accepted as the cause of poliomyelitis may be the form which this streptococcus tends to take under anærobic conditions in the central nervous system, while the larger and more typically streptococcic forms which other investigators have considered contaminations may be the identical organism grown large under suitable conditions.

However, three other investigators, Geo. Mathers, Nuzum, and Herzog, of Chicago, made similar claims for a gram-positive micrococcus which they had obtained from tissue of the central nervous system, tonsils, mesenteric glands, and from the cerebro-spinal flued by lumbar-puncture during life. These organisms injected into monkeys produced definite clinical and

pathological poliomyelitis. This micrococcus, too, occurred in small and large forms, regarding which they point out the similarity to the virus of rabies which presents itself in a large form, the negri bodies, and in the small punctiform granules which pass a filter. Whether this organism is a secondary invader (perhaps analogous to the streptococcus in scarlet fever) which in culture may become more or less closely associated with the independent virus of poliomyelitis, or is itself the cause of poliomyelitis and capable of existing in filterable and non-filterable forms, is a problem demanding still further experiment and study.

Mode of Invasion.

The virus exists constantly in the central nervous organs, on the throat, tonsils, and nasal mucosa, and intestinal secretions of persons suffering or convalescing from the disease. It occurs less frequently in other internal organs, but has not been detected in the general circulating blood of patients. It is found also in the mucous membrane of the nose and throat of healthy persons who have been in contact with cases of poliomyelitis, who thus may act as carriers and convey the disease to others. This distribution applies to abortive cases as well as to the frankly paralyzed ones.

From experiment and observation it is accepted that the entry of the virus is through the upper respiratory mucous membrane, and likewise the exit is by the ordinary secretions of the nose and throat, and, after swallowing these, by the intestinal discharges. The fact that the disease has a distinctly characteristic seasonal prevalence—constantly reaching its maximum during the late summer and early autumn—is in marked contrast to the more common diseases generally believed to be transmitted by direct contact and to find access to the body through the respiratory tract, e.g., scarlet fever, measles, diphtheria, etc., which usually are most prevalent in winter and spring. This summer prevalence has suggested the idea of transmission by insects, but the case against insects has failed up to the present. The house-fly or other insect, however, can conceivably become contaminated and mechanically convey the poison; therefore their exclusion from poliomyelitis patients should be religiously carried out.

It is generally accepted, then, that poliomyelitis is a human-borne contagious affection, the portal of entry for the virus being the upper respiratory tract—the naso-pharyngeal mucous membrane in particular. The infection can be carried by active and by passive carriers, of whom abortive and unrecognized cases are probably most important. The virus is resistant and, being protected by mucous secretions, can become attached to clothing, bedding, etc., to domestic animals and insects, and can be ground into dust and conceivably disseminated by wind. It has been found on the mucous membrane of the throat in a patient five months after the onset of the disease.

Pathology.

The virus, as we have said, seems to enter the body via the naso-pharynx—through the lymphatics of the upper nasal cavities which are in direct communication with the meninges. This view is strengthened by the anatomical findings. The earliest change in the nervous system is a hyperæmia and the collection of numbers of small mononuclear cells in the lymph spaces surrounding the meningeal blood-vessels. These lymph spaces are anatomically processes of the arachnoid spaces, and the lymph in them is in communication with the cerebro-spinal fluid. The blood-supply of the cord is derived from these meningeal vessels, and as the pathological process advances this perivascular infiltration follows along the vessels as they enter the cord from the meninges. A cellular exudate then surrounds the outer wall of the vessel, while it is also probable that there is some effect, either toxic or mechanical, on the intimal lining of the vessels, for hæmorrhages, minute or extensive, are frequent findings, and one of the prominent features of most cases is the extensive œdema. These three factors, then, cellular exudate, hæmorrhage, and œdema, all of them dependent on vascular change, may be regarded as the primary reaction of the nervous system to the virus of poliomyelitis.

The importance of the vascular system in determining the nervous lesions explains the fact that the cervical and lumbar enlargements of the cord are most affected, and that the anterior horns of the grey matter are more involved than the posterior, for these are the regions of the cord to which the blood-supply is most abundant.

It has been suggested that the process by which the vascular lesions affect the nerve-cells may be a mechanical one. Now, it is impossible to deny the fact that the virus may exert some directly toxic action on these cells; nevertheless, in many ways the clinical and anatomical

pictures are readily explained by the circulatory disturbance and the exudate. On such hypothesis the damaging effect can result in part from the direct pressure on the nerve-cells of hæmorrhage, œdema, and exudate. There is also the additional factor of anæmia following the constriction of the blood-vessels by the same merchanism. On account of this pressure and anæmia the nerve-cells degenerate. If the hæmorrhages are absorbed soon enough the cells recover their function. If, on the other hand, the anæmia and pressure have been prolonged or excessive, the nerve-cells go on to complete necrosis.

The same sequence of vascular changes and subsequent degeneration of nervous elements is found, though to a much less degree, in the brain, medulla, and pons. The same, too, in the posterior root ganglion—i.e., vessels entering the ganglia, with degeneration and necrosis of the nerve-cells. The suggestion has been made that these lesions in the sensory ganglia account for the pain which occurs so constantly in the acute stage of the disease. The changes found in other organs are less striking, but practically as constant—viz., changes in the lymphoid tissue throughout the body and in the liver. So that the disease must be regarded as a generalized process affecting parenchymatous organs, lymphoid tissue, and most particularly the nervous system.

CLASSIFICATION.

The study of any disease is simplified if the various clinical forms can be grouped together into a few definite types. In poliomyelitis, in which we have a pathological process which may extend through brain, medulla, pons, spinal cord, and spinal ganglia, or which may be localized in any part of the system, the signs and symptoms may be very diverse; hence the difficulty is readily appreciated.

Passing over the various elaborate and detailed classifications, the simplest and best from the clinical point of view seems to me to be that of Peabody and Dochez, as follows:—

(1.) Abortive cases—in which no paralysis occurs:
(2.) Cerebral cases—those rare cases in which involvement of the upper motor neurone with resulting spastic paralysis is the chief characteristic:
(3.) Bulbo-spinal cases—the great majority of cases, comprising all those with lesions in the lower motor neurone and flaccid paralysis.

This classification is not absolute, of course, because many cases are not purely of one type, either anatomically or clinically.

SUSCEPTIBILITY.

Childhood is essentially the age which is most susceptible, though adults are not immune. In the New York epidemic of 1907, 89 per cent. of the cases were under five years. Both sexes are equally liable, and social status seems to be unimportant; moreover, those attacked are usually hitherto perfectly healthy children, though other diseases, measles, etc., are often mentioned as predisposing causes. Whether the greater immunity of adults is to a non-specific resistance which develops naturally with maturity without reference to previous exposure or infection, or is specific and acquired from previous unrecognized infection with virus of poliomyelitis, is a matter of speculation, though our admission to-day of abortive cases, until recently unrecognized, indicates a greater general susceptibility than has been generally thought. Poliomyelitis is one of the infectious diseases in which immunity is conferred by one attack, whether of the abortive or paralytic type.

The protective substances do not appear in the blood until about two weeks after the onset, and have been detected as long as thirty years after an attack. If 1 c.c. of such a serum be mixed with 1 c.c. of the active virus (which is merely a filtrate of a 5-per-cent. salt sol. suspension of the spinal cord of an infected and paralysed monkey)—if these be mixed in a test-tube, incubated for two hours, refrigerated overnight, and then injected intracerebrally into a monkey, the animal is protected and does not develop poliomyelitis.

COURSE AND SYMPTOMS.

In most typical cases of poliomyelitis the course of the disease is fairly constant. The incubation period averages eight to ten days. Following the incubation period and preceding the onset of paralysis, there is in the vast majority of cases a period marked by prodromal symptoms. These are at times of such a mild and fleeting character that they may be entirely overlooked, and there is, too, a small number of cases in which the acute stage with paralysis

seems really to be the first clinical manifestation. The duration of the prodromal symptoms is on the average one to three days. The severity is variable, and it is a generally accepted fact that the severity of these symptoms bears no relation to the extent or the course of the disease.

The prodromal period has until recently received little attention from clinicians, but now, in the light of our present knowledge and our hopes for a therapeutic control of the disease, assumes an unexpected prominence. It is during this period that we must isolate and quarantine if such measures are to be efficacious, and it is only in the prodromal period before an extensive destruction of nerve-cells has taken place that we can ever hope to make treatment efficient. This, therefore, is the most important stage in the course of the disease, for on its recognization depends the possibility of controlling the infection.

The most constant symptoms of this period are: Fever; drowsiness; irritability; hyperæsthesia; pain, both spontaneous and that produced by passive motion; weakness of a limb or group of muscles; gastric symptoms, e.g., nausea and vomiting (which rarely becomes persistent); constipation or diarrhœa seems to be immaterial. That is to say, the common history is that of a previously healthy child taken suddenly ill during the summer or early fall with fever, a moderate gastro-intestinal disturbance, pain in the head, back, or legs, and often becoming quickly drowsy. On physical examination there is stiffness of the neck with resistance to flexion; the Kernig manipulation of the legs and the passive motions are painful; the child is irritable and wants to be left alone.

A clinical picture which is suggestive in the presence of an epidemic, but which otherwise shows very little of specific diagnostic value. What other methods of diagnosis can we call to our assistance? The blood examination. Peabody and Dochez, of the Rockefeller Institute, say:—

"In the prodromal period, while the total leukocyte count varies within the normal, there is a tendency towards the upper limits, i.e., more cases showed counts well above the usual extremes than below. There is, too, a definite polymorph leukocytosis, while the lmyphocyte percentages are distinctly below the usual figure. After the onset of paralysis there is a constant and well-marked leukocytosis, 20 to 30,000. There is also a constant increase of 10 to 15 per cent. in the polymorphs, and as constant a decrease of 10 to 15 in the lymphocytes. The other forms of leukocytes show no abnormalities."

The Spinal Fluid.

Without going into details, I will present the findings of the Rockefeller Institute in sixty-nine cases on this point, briefly and dogmatically:—

Fluids: Clear, a few slightly opalescent.

Pressure: Normal or slightly increased (unsatisfactory because patients were usually crying children).

Cell-count: Increased at first 35 to 990 per cm., gradually decreasing as the case progresses. In some few instances there were polymorphs, but usually at all times were from 80 to 100 per cent. mononuclears.

Globulin: Low at first, but increases during second and third week, then gradually falls.

Reduction of Fehling's is present and usually prompt. Because the blood picture and the spinal-fluid examination seem also to lack specific diagnostic features, it would be wrong to conclude that they are of no assistance, because, taken in conjunction with the history and the clinical symptoms, frequently the diagnosis can be made.

The acute stage is arbitrarily considered as the period between the onset of the paralysis and the disappearance of tenderness on spinal flexion. Fever is not a characteristic of this stage and has usually markedly subsided. Pain is a constant feature, and in general may be said to be spontaneous pain—pain caused by manipulations or tenderness to pressure of the muscles. There are some cases in which stupor is a marked early symptom. To these the term cerebral has often been loosely applied, but not accurately, because the paralysis accompanying has been of the lower neurone flaccid type, and they must be classified as bulbo-spinal. The paralysis is and has been the prominent feature. In the vast majority of cases (the bulbo-spinal type) it is a flaccid or lower neurone variety involving muscles or groups of muscles rather than limbs or areas; the distribution is quite unsystematic.

As to the relative frequency of various muscle groups, statistics show that in the great majority of cases muscles of one or both legs are affected, and in nearly 50 per cent. of cases the paralysis is limited to the legs. In the upper leg the quadriceps is most often paralysed.

In the lower leg the anterior group of muscles, i.e., peroneals, flexors of foot, and extensors of toes. Extensive leg paralyses are frequent, but complete and permanent paralysis is not the rule. In the arm the shoulder-muscles, more especially the deltoid, are most often involved. It is the general observation that the proximal muscle groups are more apt to be paralysed than the distal, and that after paralysis the distal recover more quickly and certainly. Paralysis of the spincters is very rare. Many have bladder disturbances, requiring catheterization, but this is a transient condition and probably analogous to that seen in the febrile conditions.

Practically all cases dying of poliomyelitis without complications die of respiratory failure, due to paralysis of the intercostals and diaphragm. The phremic nerve arises from a large number of roots from the 3-, 4-, and 5-cervical segments, and possibly this accounts for the fact that the action of the diaphragm is so rarely interfered with. Bulbar paralysis—most commonly the cranial nerve affections form part of a general process in which the cord is simultaneously affected, though occasionally bulbar paralyses may occur alone. The facial nerve is that most often found, though it is suggested that slight attacks of poliomyelitis may be a frequent unrecognized cause of strabismus.

The greater number of fatal cases comes under the heading of rapidly progressive cases, showing the symptom complex known as Landry's paralysis, i.e., an ascending paralysis involving first the legs (or arms and legs), intercostals, arms, neck, and diaphragm.

CEREBRAL CASES.

Just a few words as to cerebral cases. In 1885 Strimpell first called attention to the analogy between certain forms of cerebral paralysis in children and poliomyelitis. He analysed twenty-four cases, nineteen of which were below the age of four years. The onset was sudden, and there was an initial stage with fever, vomiting, and convulsions; then followed a hemiplegia, or a monoplegia of arm or leg or an ataxia without paralysis. There was no atrophy of muscles, no reaction of degeneration, and reflexes were usually exaggerated.

In 1898 Medin during the Swedish epidemic noted three cases with fever, drowsiness, convulsions, spastic hemiplegia, and exaggerated reflexes. In two of these the sixth cranial nerve was also paralysed, thus forming a connecting-link between the spinal and cerebral forms. Thus there are some cases, rare it is true, in which the pathological lesion is in the brain itself, and in which the clinical manifestations suggest a disturbance of the upper motor neurone. On the other hand, there are some facts which, assuming such a classification, are not easily explained.

(1.) In spite of the fact that monkeys are usually inoculated with serum intracerebrally, the paralyses are always spinal and not cerebral.

(2.) With the tremendous increase in the incidence of poliomyelitis during the past few years and its more general recognition, it is remarkable there has not been a corresponding increase in the number of cerebral cases reported.

Lastly, the abortive type of case. These are the cases of poliomyelitis which do not develop paralysis. They are believed to contribute at least 50 per cent. of the total. They are just as truly and dangerously poliomyelitis (from the contagious standpoint) as the frankly paralytic cases, except that the nervous system has been spared. The blood-serum of abortive cases neutralizes the virus in vitro just as does the serum of paralysed patients, and the spinal-fluid picture is similar. The symptoms, apart from the paralysis, are similar and need not be repeated here.

PROGNOSIS.

Prognosis in poliomyelitis is a complicated problem. We are asked to foretell:—

1st. In the preparalytic stage, whether paralysis will occur.
2nd. When it does occur, will it advance?
3rd. How much residual paralysis.
4th. Question of life and death.

As to the first, it is impossible to tell by any symptoms or signs whether paralysis will or will not occur, though twitchings and convulsive movements in the muscles have been cited as indicating the area affected.

As to the second, will it advance? As a rule, the initial paralysis is maximum and final, but there are enough examples of delayed involvement to make anticipation of further paralysis justified up to the seventh or eighth day.

As to the question of life or death: In a general way we may say the mortality has varied in epidemics from 6 to 25 per cent. In younger children the outlook is better than in older ones and adults. But such statistics are of little help in the presence of a given case of poliomyelitis, for this reason: In poliomyelitis there is a peculiar element of chance not present in other infectious diseases—viz., the accident of the lesion destroying the phrenic and intercostal centres simultaneously, an accident which is always fatal.

In most acute infections we regard death as due to a toxæmia which overwhelms the body and interferes with its functions until finally some organ, usually the heart, weakens and fails. But in poliomyelitis, while in some few instances death is due to a complication, usually broncho-pneumonia, ordinarily the toxæmia is a negligible quantity and death is essentially a mechanical one due to paralysis of the muscles of respiration. It occurs most often on the fourth or fifth day of the paralysis.

Treatment.

Whatever the future may bring forth, we to-day have to admit that there is no specific therapy by which the onset of poliomyelitis may be warded off, the paralysis prevented, or the resolution of the inflammatory process and consequently return of function hastened.

The problem of treatment is, then: First, to prevent the spread of the disease; second, to treat the symptoms; third, restore muscular efficiency; and, fourth, to prevent and correct deformities.

First: Prophylaxis. The incubation period is probably about eight days. The infectivity is unknown, but has been arbitrarily fixed at less than six weeks. It is spread by personal contact, though there may be other contributing causes at present unknown. Admitting that owing to unrecognized abortive cases and carriers effective preventive measures are difficult, we can only at present demand the following:—

(1.) All suspected and recognized cases must be reported:

(2.) Patients are to be isolated for six weeks just as carefully as we do scarlet fever, for instance, with windows screened, animals excluded, etc.:

(3.) All discharges, naso-pharyngeal and intestinal, to be destroyed:

(4.) All contacts quarantined or at least under observation for two weeks after last exposure:

(5.) Regulation or prohibition of intimate congregation of children.

Second: During the acute stage absolute rest in bed is an essential; thus will the damaged cord have the best chance for repair.

Cold sponging is inadvisable, tending to cause increased congestion of the central nervous system. The value of an ice-bag to the spine is also doubtful. These cold applications cause an increase of pain.

Constipation should be avoided and the child must not be allowed to forget to urinate; catheterize if necessary, for there may be at first some loss of bladder irritability.

Pain is the most prominent sypmtom demanding attention. This is most often due to passive motion, thus indicating the necessity for care and gentleness in handling the patient.

Heat, dry heat, wrapping the limb in cotton, etc., is a simple method of alleviating. Immobilizing by splint or sand-bag is helpful.

Opiates may be necessary and should not be withheld from children because, unlike adults, they cannot voice their demands.

Contractures and deformities occur early from the pull of unaffected muscles and the over-stretching of injured ones if great care is not taken. Dropped foot is perhaps the commonest, so a cradle should be used to support the bedclothes and the foot kept at right angles. Sand-bags may be used or light apparatus. The danger of restraining apparatus is that the limb may be kept too quiet and prevent active efforts to use the muscles at a time when motion should be encouraged. A good rule is to apply the apparatus at night only and leave the limbs free to move during the day. The phase of convalescence begins with the disappearance of tenderness and lasts from one and a half to two years, after which the condition has become more or less stationary.

The pathologic condition at this stage is that the hæmorrhagic myelitis is subsiding, the perivascular infiltration is being absorbed, cells are resuming their function, and the clinical manifestations of these processes is expressed by what we term "spontaneous improvement."

This is the period when the problem arises as to when the case ceases to be a medical one and comes in the sphere of the orthopedist. A too early resort to surgery and mechanical methods may cause the patient to rely too much on these and cease developing his muscles to their utmost, while, on the other hand, it is unfair to postpone the assistance of the orthopedist until deformities have occurred.

At this stage Lovett, of Boston, favours ambulatory treatment, i.e., the patient is permitted to be up and about, insisting strongly, however, on the avoidance of fatigue. His general rule as to apparatus at this time is that it is to be used if the patient cannot stand without it, or if in standing or walking a position of deformity is assumed, because deformity leads to stretching of soft parts, and, if persisted in, to permanent bony changes.

The therapeutic measures to be used locally are massage, electricity, heat, and muscle-training. Massage is used only after all tenderness has disappeared, and then very gently and briefly. Its proper use retards muscular atrophy and promotes muscular tone; more than this must not be expected of it. Its overuse is responsible for much harm. Electricity has done more harm probably than good; he does not advocate it. Muscle-training, however, is the measure of greatest value at this stage. Muscle-training attempts to force an impulse from brain to muscle, to enable it, if possible, to open up new paths around affected centres in the cord. It is based on the fact that as a rule the entire nervous control of a given muscle is not wiped out as a whole, but only in part. It is universally agreed that one voluntary effort on the part of the patient is worth a dozen passive movements made for him. One should not forget that over-stretched muscles are placed at a disadvantage, and that fatigue and overtreatment by massage and exercises are detrimental factors of the highest importance.

The third stage is called the stationary stage, and begins about two years after the onset. The dominant requirements of this stage are operative, and are, first, the correction of deformity, and, second, operations to improve functions.

Just a word now as to drugs and specific treatment:—

(1.) Urotropin has been used more or less extensively as a therapeutic measure. However, when we stop to consider that in urinary conditions it has no antiseptic effects except in an acid medium, we cannot expect it to show much germicidal activity in the cerebral-spinal fluid, which is alkaline. Its use, I think, has been discontinued.

(2.) Adrenalin was advocated by Meltzer, of New York, though both the Rockefeller Institute and the Health Boards of New York discredited it. He injected ½ to 1 c.c. of a 1,000 sol. intraspinally every four hours for several doses. His reasoning, however, was interesting even if not convincing. He said: "Any inflammatory focus is surrounded by zones of hyperemic exudation and œdema. Experimenting on rabbits' ears, he found that an injection of adrenalin caused the zones of exudation and œdema to disappear completely for some time and reduced the inflammatory swelling to a small focus in the centre. The pathological condition of the cord in poliomyelitis is a similar one; the procedure is harmless, at any rate; therefore, if the same effect can be produced even temporarily, it is worthy of trial."

Ordinary blood-serum has been used injected intraspinally from parent to child. Horse-serum in the form of antitoxin likewise, but with no definite results. Lumbar-puncture is advocated, particularly in those cases showing signs of pressure or prolonged stupor, with apparent good effect symptomatically. Serum from convalescent patients—even those recovered, twenty-five to thirty years—is used, and does seem the logical procedure. It contains protective bodies which, as we have noted, will neutralize the virus when mixed in vitro in certain proportions, and will effectually prevent the experimental production of the disease in monkeys. The difficulties are, of course, the limited quantity to be obtained from convalescent human patients. It is injected intraspinally after the withdrawal of a certain quantity of cerebral-spinal fluid, just as is done in meningitis, and repeated at intervals.

A suggestion has been made by Wells, of Chicago, that the injections should be given intravenously, reasoning that the lesions in the cord are essentially perivascular infiltrations, and also that the lesions are not confined to the nervous system, but involve various other tissues and organs (lymph-glands, etc.). Moreover, a much greater quantity of serum containing the necessary antibodies is thus introduced to the patient.

Summing up, then, our knowledge of the disease, we must admit that our position in regard to poliomyelitis, its prevention, its diagnosis, and its treatment, is unsatisfactory to-day. Never-

theless, with the study and investigation that is being devoted to it, we can with assurance expect in the near future a scientific solution of the problem; a solution which will include a practical and reliable diagnostic test for the detection of clinical cases and carriers; a rational scientific cure of the disease itself; and, thirdly, what in view of the character of the disease and the early disastrous effects is much more important, a means of conferring artificial immunity against it.

DISCUSSION ON DR. CARDER'S PAPER.

Dr. R. E. McKechnie (Vancouver): I have listened with much pleasure to Dr. Carder's paper and must congratulate him on it. It is very comprehensive and he has brought the subject up to date. There is very little that can be added to what he has read to us. The only unsatisfactory thing about it is, there are so many indefinite things as to the nature of treatment, etc., but the paper is a particularly good one and thoroughly up to date, and Dr. Carder is to be congratulated on his résumé of the subject. My first acquaintance with it, the first case I ever saw occur in practice, was a relative of mine. I cannot say that I recognized it at that time, because I had known the youngster from the time I was a youngster myself; she is about my own age and still living.

Dr. Carder gives three types—one cerebral type; this was the cerebral type. The second case was diagnosed in Montreal General Hospital by Dr. Stewart in 1890, the same year Dr. Carder quotes the authority giving the first thorough description of the disease. Of course, no one had any idea as to whether it was an infectious disease or not. The case was in one of the general wards, and subsequently I saw other cases in the general wards.

In my own practice, in the ten years, or a little more, that I was in Nanaimo District I saw some five cases—no two cases in any one year—and that shows no infection occurred in those cases. Since I have been in Vancouver I have seen several cases, but as my work is largely surgical I do not run into it so much, and I fancy our climate is a good climate or we would see it more often.

In discussing the virus or germ that causes this disease, there is something which makes us think of goitre. We have heard of the transmission of goitre through drinking-wells, and in the District of Lillooet we find the sheep and dogs have goitre, so we find the production of goitre is, like the production of poliomyelitis, from a certain virus. There is a similarity between the two—the germ that produces the virus, which produces one, passes through a filter the same as goitre virus; both can be cured by heat; neither by cold, so there is a little similarity. I would like to see that one of the subjects for your next meeting for the study of goitre in British Columbia.

There is one point in Dr. Carder's paper which he brought out very nicely; that is the partial theory of the cause and symptoms in these cases. It is the mechanical theory, and to my mind is the correct one. Many of these cases are recognized by symptoms of paralysis. In more than one case the child was found paralysed when first noticed. That brings me to a case I have in the hospital at this moment. A man was being hoisted out of a mine in a bucket with several other men and there was a beam that had to be passed where men were supposed to duck their heads. This was the tallest man in the bucket and he could not bend, could not miss the beam. He was struck on the head and there was a sharp twist and fracture of four cerebral vertebræ. He was paralysed in both arms and both legs when he came to the hospital. The censory columns are not much injured because he has complete sensation. There is some little injury, the same as in poliomyelitis; but his anterior columns got the brunt of the damage, the same as occurs in poliomyelitis cases. Here is where the similarity comes in between poliomyelitis and a traumatic case. The result in each case will depend on the number of nerve-cells which are absolutely destroyed, the number of nerve-cells partially destroyed that later will die, the number that have been partially injured and will recover, and the number that have not been hurt at all; and that all happens in a traumatic case almost immediately, and in a poliomyelitis case almost immediately. You have to direct your treatment to the conditions which already exist. Medicines are not going to do any good. Your first duty will be to combat the present condition, treating symptomatically only, and later on you will come to the mechanical and mental treatment of the case. Dr. Carder has emphasized the fact that death in this case is mechanical, the same as in traumatic cases.

One of the most valuable assets in treating these cases is optimism. A doctor who is not optimistic ought to be put out of the profession. When you have a long-drawn-out case like poliomyelitis, it is going to take a great deal of optimism.

The most valuable therapeutic agency is volition; that is, for the will to work to make the muscle work. One attempted move is worth a dozen passive movements. That is the most important part in the early stage of the case. In dealing with children two or three years old, you cannot impart much optimism to a youngster of that age, but you probably can to the mother or the nurse in attendance, and this will help to cure the condition. In older children and in adults you can impress the importance of this on them and so make them help to cure themselves.

Another important point Dr. Carder emphasized was the danger of overdoing your exercises, the danger of fatigue. You can eat too much meat or too much bread; you can overdo almost anything, and you can overdo exercises. Take the case of poliomyelitis, where you have some nerve-cells whose vitality is in the balance, you can overdo the exercises. You have to use your best judgment in working along those lines. Following that, if the case is left alone, you will have contractures; one set of muscles has been paralysed, but the opposing set is still active, and you will have contractures. If you go to the military annex hospital you will see them working with patients along these lines, not cases of poliomyelitis, but of injury to the nerves by military wounds, and such a line of treatment will be used here.

I have not touched on the important discussion at all, but purely the Department of Health aspect of the doctor's paper; I leave that to the others. His paper covers much of what I have been enunciating here and much of what was in my mind.

Dr. Stanier: I cannot add anything at all to Dr. Carder's most exhaustive paper on the scientific aspect, but I can speak from a personal point of view. I think it was in the fall of 1911 I had an epidemic of this in the Victoria District. It was a long, hot, dry summer, when we could expect something of that kind. Perhaps that obviates the growth of that particular disease, the same as we get spinal-meningitis cases after a cold, wet winter.

It must have been about September 15th; I had been camping, and a case occurred that had not been diagnosed on the other side of the bay, about three miles away, a young chap about twelve, and he was dead by the time the doctor arrived. I did not see the case at the time and was not paying much attention to it, as I had been on my holidays. The next thing I heard was that a dog was paralysed in the hind quarters, and then my own setter came in completely paralysed in the hind quarters. Shortly after that I was out shooting and I was seized with a violent pain around the loins and lower spine, and I could not get back to town; I remember the agony of that day. The paralysis occurs, of course, much more frequently in youth, but I was not the only adult case. I cannot to this day stand any great strain, on account of weakness in the spine.

Dr. Carder says about 50 per cent. are abortive cases. I was in Toronto about two years ago and I was told they considered ninety-eight cases of meningitis occurred for two that were recognized, because the symptoms were not definite enough. This is the case in poliomyelitis; only when it gets into the nervous system is it recognized.

As regards treatment, my case was diagnosed, a doctor was in attendance. I realized I was seriously ill, terribly constipated, and wanting to lie down—very tender and not much use of my legs. Continued heat was the only thing that could be done to relieve it. I can understand that now, since hearing the description of the vascular changes.

As regards the effects, a boy came into my office the other day; he was about six or seven years old; he had this when an infant, and he has now practically complete paralysis of the biceps and triceps of the forearm, and hand cannot be used. I took an X-ray, and have tried to restore the muscular condition, but he is liable to dislocation on account of the loose condition. I am putting his arm in a rectangular splint. I find that massage is decidedly a good thing, but should be only mild in the early stages.

Dr. Carder (replies to discussion): The hour is late, and I do not think there is anything I can add, except perhaps to draw attention again to what I tried to emphasize in the paper. There is a tendency to want to do something too early, probably against their own better judgment. That is one point that should be carefully considered. Absolute rest is essential, and, better still, immobilization; do not be afraid to put a cast on or a splint. I think in New York 100 children are practically encased in plaster. And immediately after the plaster cast is applied

the pain eases and the children are quite happy. Absolute rest is therefore essential. In time passive movements should be encouraged, and you can encourage the child to move, because, as stated, it is better than passive movement, but to do this too soon only causes damage to the nerve-cells and increases the irritation. It has been suggested that even four or five months should elapse before massage is applied.

The Chairman: That concludes the programme for to-day. To-morrow morning we have some exceedingly interesting matter and a discussion of the question of tuberculosis.

The Convention adjourned at 5.30 to 9.30 to-morrow morning.

THURSDAY, September 13th, 1917.

Morning Session.

Dr. F. T. Underhill in the chair.

The Chairman: I will call this meeting to order. We have a long and very important programme before us to-day, and we have first this morning the question of tuberculosis, in which we are all interested in this Province. I am not going to take up time and I will simply ask Dr. Vrooman to read his paper. By the way, discussion will be opened by Dr. Wesbrook, and then we will ask Dr. Walker and Dr. Proctor to speak to this paper.

Dr. Young: Dr. MacLean received a letter this morning from Mr. Harris, Secretary of the Vancouver Association for Promoting Speech of the Deaf. (Reads letter.) If occasion will warrant during the day I will phone the office and we may be able to have some talk on this very interesting subject.

Dr. Vrooman then read his paper on tuberculosis.

TUBERCULOSIS: HOW SHALL IT BE HANDLED IN BRITISH COLUMBIA?

BY C. H. VROOMAN, M.D., C.M., MEDICAL SUPERINTENDENT, KING EDWARD SANATORIUM, TRANQUILLE, B.C.

In 400 B.C. Hippocrates wrote concerning tuberculosis: "The greatest and most dangerous disease and the one that proved fatal to the greatest number was the consumption." So that the problem we are considering is one which has afflicted the human race for many thousands of years. Hippocrates' description of the long-drawn-out illness of an advanced case of consumption is wonderfully accurate. In other medical writings of this time there is distinct evidence that the medical men of ancient Greece believed in the contagiousness of consumption. Yet it was only in 1882, thirty-five years ago, that Robert Koch discovered the tubercle bacillus, and we have since that time been able to make great progress in the study of the pathology of tuberculosis. As our present methods, both of treatment and prevention, rest on the essential pathology of tuberculosis, it is necessary before considering those subjects to briefly review our present-day knowledge of the pathology.

To quote again from the father of medicine: "I look upon it as being a great part of the art to be able to judge properly of that which has been written. For he that knows and makes a proper use of these things would appear to me not likely to commit any great mistake in the art." Out of the volumes that have been written on tuberculosis certain conclusions now appear to have been reached, based upon accurate scientific observation and experiment. With Hippocrates' admonition in mind, let us examine briefly some of these conclusions and apply them to our present needs.

The tubercle bacillus is the most ubiquitous parasite the human race has to contend with. It is so widespread, both in man and animals, that there is no doubt that we all, before reaching adult years, become its unwilling host, and the most of us without doubt remain the host of living tubercle bacillus during the rest of our days. It is then only because of the high immunity we have developed as a race to this parasite that only about 10 to 15 per cent. of us become clinically ill with tuberculosis. The rest of us accommodate the invader like the Allies did the German spies in the pre-war days—without knowledge, care, or suspicion; but to carry our analogy still farther, these same spies may, when in sufficient numbers, and at a time when our defences are least prepared, lead an invasion that may as suddenly overwhelm our organism as the Germans did Belgium in 1914. It will be readily seen that being infected with the tubercle bacillus does not necessarily mean that one is ill with tuberculosis and requires treatment. If

that were so, 90 per cent. of the white race would require treatment. It is only when the infection is sufficiently massive to produce symptoms that we speak of a person being ill with tuberculosis.

Chronologically, the earliest tuberculosis encountered is the bronchial-gland tuberculosis of children. The researches of Shon* and others show that the most common mode of entrance is by inhalation, and the setting-up of a small focus of infection in the lungs. This primary focus generally heals, but the bronchial glands draining the area become infected, and if the infection is sufficiently massive we may have developed the well-defined clinical symptoms of bronchial-gland tuberculosis. There is no doubt, as shown by the experiments of Ravenal† and others, that the bronchial glands may be infected from the intestinal tract, and that the ingestion of infected food may cause glandular tuberculosis without lesion in the intestines. The balance of evidence seems to be in favour of the hypothesis that most infection is conveyed by inhalation of tubercle bacillus, either in dust or moist droplets, eliminated by open cases of consumption. The chief means, then, for the spread of tuberculosis is the advanced and open case. Bovine tuberculosis may be, undoubtedly, conveyed by milk, and is the cause of a great deal of bone, joint, skin, and intestinal tuberculosis in children, but it is rarely a cause of pulmonary tuberculosis. Not more than one-twelfth of all the tuberculosis that has to be dealt with is due to bovine origin. In a country like British Columbia, where cows are kept well tested, the bovine tuberculosis originating in this Province must be exceedingly small.

Age of Infection.—About 15 per cent. of children are infected the first year of life, about 50 per cent. the first five years, and 80 per cent. are infected the first fourteen. While the mortality is comparatively high during the first two years, after that, from two to fifteen years, the mortality from tuberculosis is comparatively low, and during this period it is the milder forms of tuberculosis that we have to deal with. The mortality starts to rise at fifteen and maintains a high level until about forty, when it drops again.

Bronchial-gland Tuberculosis in Childhood.—Bronchial-gland tuberculosis in children may be divided into three classes:—

First: Those in which the primary infection is small and the general resistance large. The body-tissues react well to the invader; all the defences are on the alert; and there is a rapid formation of fibrous tissue around the infected gland, and the parasite is promptly walled off. These children probably never have any symptoms, and the effect of this small invasion is, on the whole, good for the organism, as there is developed a certain immunity to subsequent invasions. There is also developed the well-known hypersensitiveness to the various tuberculin reactions—Von Pirquet's, Moro's, etc. Though a person may never develop any clinical symptoms, this hypersensitiveness continues throughout life. It might be as well to emphasize this point, as there is a tendency sometimes to give undue weight to a positive skin reaction. A positive Von Pirquet always signifies infection at some time with the tubercle bacillus, but it is so delicate that it may be produced by an exceedingly small focus well healed and doing no harm to the organism.

Second: Those in which there is a moderate invasion the tissues react fairly well, but a number of glands become involved. There are little, if any, clinical evidences of infection. There is for a time a "biochemical balance" established between the host and the parasite. At any time, though, that this biochemical balance is disturbed there is a multiplication and a renewed activity of the parasite until we have the third type.

Third: By reason of a continuous or massive infection, or because the biochemical balance is disturbed by the disease, such as measles, whooping-cough, etc., or bad living conditions, we may have what is the most frequent type of early clinical tuberculosis in children from two to fourteen.

Allow me to quote a description of these cases from a recent article:‡ "Clinically, these children present histories which are fairly typical. In these histories one may or may not be able to trace the source of infection. If the parents are of average intelligence, however, one can trace the source of infection in a very much larger percentage of cases than is possible in older individuals. Quite naturally, of course, one would hunt this source of infection in the immediate family of the patient. Failing there, one is often able to find it in the close vicinity of the patient's home.

* Shon, A. The Primary Lung Focus of Tuberculosis in Children. Trans. E. Barty King. 1916.
† Ravenal, M. P. Jour. A.M.A., 1916, LXVI., 613.
‡ Gekel, W. A. Arch. Int. Med., 1917, Vol. XX., 32.

"Coming to the history of the case itself, we find that, on close questioning, the parents will often say that the child has stopped growing, or does not seem to gain in weight. Along with this the parents will notice that the child does not have the energy that other healthy children have, and does not have the same inclination to play. The child tires easily, is apt to be irritable and cross. The appetite is slightly below par and is often capricious. There may or may not be some digestive disturbance. Often, however, constipation is noted, possibly due to the lack of exercise on the part of the child. Sometimes these children will have night-sweats, and the mother on close questioning will recall that the child has been feverish in the afternoons. There may or may not be a slight cough, which is hacking and unproductive. If the child is going to school, the teacher will often complain that he is inattentive and does not seem to keep his mind on his school-work. Occasionally one will be able to obtain a history of a pleuritic pain. As will be noticed, most of these symptoms are constitutional symptoms which may be present in other conditions, such as chronically diseased tonsils, middle-ear disease, and other cryptic infections. Undoubtedly many of these little patients have had their tonsils removed in the belief that this was the cause of the constitutional condition.

"On physical examination one finds a child that is slightly undernourished, apt to look pasty, slightly anæmic, and not seldom stunted in growth. If there are diseased tonsils or middle ears present, there may be a slight enlargement of the cervical glands, which, however, are not necessarily tubercular. If there are decayed teeth, one is apt to find a similar enlargement of the submaxillary glands. Inspection very often reveals a slight or sometimes marked enlargement of the superficial veins of the chest, both anteriorly and posteriorly. The mobility of the chest-wall on respiration is seldom retarded, and is usually equal on both sides. There are very rarely evidences of any retraction. A careful percussion of the interscapular region will occasionally reveal a slight change in the note. Often after the fifth or sixth year one notices a slight diminution of resonance over the right apex, anteriorly and posteriorly, which does not necessarily indicate any underlying pulmonary disease. There are usually no evidences of pleuritic adhesions. Auscultation will give a positive D'Espine sign, very rarely any rales, occasionally friction-sounds at one base or the other. Along with the slight change of percussion to be found after the fifth or sixth year, one begins to notice a slight increase in the intensity of the breath-sounds over the right apex as compared with the left. This discrepancy between the apices is found from this age on, and may be considered normal.

"On observing such a patient for another week or two, one will find that the Von Pirquet reaction is positive in a very large percentage of the cases. The pulse is unstable, even when the child is kept quiet, ranging in the evenings from 110 as high as 140. The temperature will also be unstable, sometimes showing marked amplitudes, at other times showing evening rises to 99.2, 99.4, and 100 Fahr., and even higher. On prolonged observation over a period of months one notices, further, a flat-weight curve. Even on a carefully selected diet the weight of such children often remains stationary as long as a year before there is any increase."

This type of bronchial-gland tuberculosis in children is particularly amenable to treatment, and it is for these children that we should have our open-air schools and special sanatorium pavilions. By the early discovery and treatment of these cases many well-marked cases of pulmonary tuberculosis will be prevented from developing in later life. In other words, put these children under such conditions that their health is kept above par, and these infected and caseous glands will be enclosed in such a tough sheath of fibrous tissue that there will be little danger of them breaking down under the stress of early adult life. A man's immunity to pulmonary tuberculosis is to a large extent dependent on the strength of the fibrous capsule which walls off the infection received in childhood.

Phthisis Pulmonalis.—As pointed out before, the most of our cases of pulmonary tuberculosis show themselves between the ages of fifteen and forty-five. The parasite gained its entrance in childhood, and it lived a secluded and quiet life in the bronchial glands until the opportunity arose for it to multiply and replenish itself at the expense of the tissue and often the life of the host. That the infection of tuberculosis may occur from without in adults is deemed impossible by some, and all investigators admit it is most difficult to infect adults from without, and then only by massive and continuous dosage. Phthisis pulmonalis in adults is, in most cases, caused by infection from within. The point that pulmonary tuberculosis develops from reinfection from within, and not by infection from without, has an important bearing upon preventive measures.

Whether a person develops pulmonary tuberculosis from these enlarged and infected bronchial glands is more or less due to the occurrence of what might be called the accidents of life. As Krause puts it:* "The development of tuberculosis disease from old benign tubercle depends largely on whether the patient gets a cold, rows a race, or becomes pregnant at the wrong time."

One man may carry through life a chain of enlarged solerosed glands that never give him any trouble. Another may only have a few, but situated close to a bronchus; its wall may become softened, due to inflammatory changes produced by an acute attack of influenza, and it may ulcerate into the bronchus. The infectious caseous material is aspirated into the alveoli, and the practitioner is often surprised to find an attack of influenza developing into a tuberculous pneumonia. It is not within the scope of this paper to deal with the varied forms of pulmonary tuberculosis. Fortunately the great percentage of secondary infections are not so gross as to involve a whole lobe in a few days. The onset is generally insidious, only small areas being involved, and the patient at this time responds most readily to the treatment.

The absorption, though, of the products of the tubercle baccilli does cause definite symptoms, and the diagnosis, when made early, often means life to the patient, while delay in the diagnosis for six or twelve months without proper treatment often spells death.

It would be straying from my subject to go into the details of early diagnosis, but I would like to emphasize that diagnosis in most cases can be made by symptoms alone. Physical signs merely tell the extent of the disease. Slight cough, fever without discoverable cause, slight, but continuous, loss of weight and strength, anorexia, and indigestion—with these symptoms tuberculosis should always be excluded by a careful examination of the lungs. A history of hæmoptysis clinches the diagnosis without examination. An examination which shows a few moist rales after cough at either apex means in 95 per cent. of cases pulmonary tuberculosis and the patient should be treated as such. The occasional non-tuberculous case that would be treated is negligible in comparison with the number who would get treatment in the early stages if this simple rule were followed. It does not require exceptional skill to diagnose clinical tuberculosis, but it does require careful and prolonged examination. It is perfectly appalling the mistakes that some, otherwise good, practitioners make simply because of lack of care in regard for the essentials. There is scarcely a month passes in which I do not have a patient give me a history of a frank hæmoptysis in which some practitioner has not told the patient it was due to a hæmorrhage from the throat, or were assured afterwards that the lungs were all right. Hæmoptysis, unless due to some readily diagnosed other cause, such as mitral stenosis, always means active tuberculosis, and should be so treated whether there are any physical signs in the lungs or not.

Having traced our infection by the bronchial glands and shown how in early adult life this may under suitable conditions cause clinical pulmonary tuberculosis, it is not my purpose to further describe the many different forms that may develop. It will be readily seen, though, that a case is not always incipient because the onset of symptoms were of recent origin. Many cases are advanced when they first consult a physician. The terms incipient, moderately advanced, and far advanced have rather to do with extent of disease when symptoms are first observed and have no significance as to the time of onset. The proper classification, though, has a great bearing upon the prognosis and time required for treatment.

Cases that are incipient when discovered will sometimes, in spite of treatment, steadily progress and become far advanced and then become arrested. Advanced cases, with an apparently hopeless attack, will suddenly under proper treatment, and sometimes under most improper treatment, become quiescent, and the patient may be able to resume an almost normal working-life for a period of years. It is because of this that I hold no institution should be labelled a hospital for hopeless cases, and the proper function of all institutions caring for tuberculosis is to treat all cases who are ill. Such institutions should have wards arranged so that far-advanced and bed patients could be segregated from those who are not confined to bed. The prognosis and course of a case of pulmonary tuberculosis is varied so much by periods of quiescence and of exacerbation that in this more than any other disease we must exclaim with Hippocrates, "Experience is fallacious and judgment difficult."

Having thus reviewed briefly some of the facts known in regard to infection and pathology of tuberculosis, it remains for us to consider that most important of our problem—viz., prevention. On paper the problem looks simple enough.

* Krause, A. K. Am. Review of Tb., 1917, Vol. I, 65.

First: To put all in healthy environment, with good housing and proper food, which are essential preliminaries to good habits. This is a basic economic question and its discussion would carry us somewhat far afield. It may, though, be stated that any agency which tends to remove poverty, bad living conditions, and drink is going to help to remove the curse of the white plague.

Second: To recognize the disease early and put patients in the best possible circumstances to promote cure.

Third: To guard the community against the dangers associated with the advanced cases.

It is the two latter portions of the problem that we are more immediately concerned with in this discussion, and the paper simplicity of the problem somewhat disappears as the different activities involved in their complete solution are examined. To recognize the disease early means both education of general public and medical profession. And it means the provision of sufficient sanatorium accommodation where these patients may learn how to cure themselves.

To guard the community against the open infectious cases means, first, that these open cases shall be known to the Health Officer, and, when known, that he shall be able to keep them under adequate supervision either in hospitals or under safe conditions at home. The Health Officer who reports his community free of tuberculosis merely because cases are not reported to him by the medical practitioners is burying his head, ostrich-like, in the sands of ignorance. The co-operation of the practitioner can and must be secured, and the surest way to gain this co-operation is the knowledge by physicians that by notifying their cases real help will be given in the care of the patient and that the community will be benefited. The general practitioner is the backbone of the medical profession, and he is always ready to co-operate in any movement to benefit the health of his patient or the welfare of the community.

The headquarters of any campaign in any community against tuberculosis must be the establishment of a tuberculosis dispensary in charge of a specially trained dispensary nurse. The dispensary nurse should be the accredited agent of the Health Department, and her duty would be to actively search for cases of tuberculosis. She would keep under supervision all known open cases. When an advanced case was discovered she would arrange for the examination of all contacts, particularly children. She would arrange for the proper institutional care of all diagnosed as requiring that care. Her duty would be multifarious, but, in short, she would be the adviser and friend of all those afflicted with tuberculosis. The dispensary would be the clearing-house, and while part of the activities of the Health Department, it would be necessary to have the medical part of the work under the supervision of a physician having special knowledge of tuberculosis. This means that supervising the various dispensaries in the Province there would be a Tuberculosis Officer. It may be objected that dispensaries are all right for the larger cities, but how about the rural communities? There is to my mind no reason why there should not be dispensaries in the rural communities, but in the rural communities the work would be widened to embrace all health matters.

It would be useless to establish dispensaries unless there were hospital beds where patients discovered might be treated. It should then be laid down as a basic principle that all general hospitals should provide special wards for the advanced cases of tuberculosis in their community. It is quite true that in British Columbia all hospitals have to provide some beds for tuberculosis, but the number is ridiculously small. They are generally the poorest wards in the hospital, and in place of encouraging patients to be treated there the hospital authorities discourage them in every way possible. To provide anywhere near adequate accommodation for the tubercular cases requiring treatment there should be in British Columbia hospital and sanatorium beds equal at least to the annual death-rate from tuberculosis—viz., about 400. That would mean providing at Tranquille about 250 to 300 beds. The most of the beds at the sanatorium would be reserved for those likely to benefit by treatment, not necessarily all incipient cases, but moderately advanced and advanced cases, who have a chance to get well. There would necessarily have to be beds for advanced incurable cases, as not all are going to do well, and it is not possible to send every advanced dying case to their home hospital. It would mean seventy-five beds in Vancouver, thirty-five beds in Victoria, and forty beds divided among the other hospitals of the Province. In these hospital beds would be treated the open case awaiting admission to the sanatorium, and the advanced incurable case who wished to be near their friends during their last days.

In charge of the various dispensaries and acting as consultant to the various hospitals should be a Provincial Tuberculosis Officer. His work would be to supervise and co-ordinate the various anti-tuberculosis efforts, to act as consultant to the dispensaries and hospitals. His services should be available free to general practitioners in the diagnosis of suspicious cases. It must be recognized that very few practitioners have had the opportunity of obtaining special knowledge in regard to the diagnosis and treatment of pulmonary tuberculosis. It is only of recent years that medical students have been given the opportunity to study early cases of pulmonary tuberculosis in sanatoria or special hospital wards. This, then, would be the scheme:—

First: To establish in the various centres of British Columbia tuberculosis dispensaries under charge of a specially trained nurse. This would be the central bureau. Cases would come here for diagnosis, advanced cases sent to suitable hospitals, cases who might be benefited sent to the sanatorium, predisposed children kept under supervision, patients discharged from the sanatorium would report here for re-examination, etc.

Second: The provision at once in this Province of beds for the special care of pulmonary tuberculosis equal to the death-rate—viz., 400.

Third: In charge of the dispensaries and acting as consultant specialist, a Chief Tuberculosis Officer.

This scheme is no experiment; it was first originated by Sir Robert Philip, of Edinburgh, and has been adopted in the British Isles as the best scheme in both rural and urban districts for handling the tuberculosis problem. That it is effective is shown by the fall of the death-rate in the communities where it has been tried. In 1900 the death-rate in England was 19 per 10,000; in 1910 the death-rate from tuberculosis was reduced to 14.3 per 10,000. The most marked reduction has occurred in the communities where the most thorough methods have been adopted.

Still more striking comment upon the success of these methods was made recently by Dr. Hermann M. Biggs,* of New York, after a recent visit both to England and France to investigate the effect of war upon the incidence of tuberculosis.

Dr. Biggs says: "For many years in England an active anti-tuberculosis campaign has been carried on, and there has been a steadily and constantly decreasing death-rate from the disease. The death-rate from pulmonary tuberculosis there is now about 1 per 1,000 of the population, as compared with 1½ in New York State and 3 in France. England has the lowest tuberculosis rate of any of the great countries of the world. In contrast to England, France has done practically nothing before the war for the prevention of tuberculosis. Such anti-tuberculosis movements as had been taken were local and sporadic in character and were solely the result of private initiative. The sanitary authorities had never taken official cognizance of the disease, and notification of it is not required in France even now. There had been no provisions for institutional care either of early or advanced cases, and but few dispensaries.

"At the beginning of the war there were only 1,000 sanatorium beds in the whole of France for tuberculosis, and these were in private institutions. There was no provision for the care of advanced cases, excepting as they were received in the general wards of the general hospitals. (You will recall that this method of care was prohibited more than twenty years ago in New York City.)

"The death-rate from tuberculosis in France has been continuously high, and especially high in the cities, and has decreased slowly and but little. For the whole of France before the war it was nearly 3 per 1,000, and in many of the cities is was much higher. In some cities, as, for example, in Havre, the death-rate last year was more than three times that of New York City, and the tuberculosis death-rate alone of Havre was equal to 40 per cent. of the total death-rate from all causes in New York City.

"The results, as I said, are exactly what one would have anticipated—the development of tens of thousands of cases of tuberculosis among the troops. By the end of December, 1915, 86,000 soldiers had been returned to their homes with active tuberculosis disease. In February of this year it was estimated that about 150,000 had thus been returned, and more are constantly being discharged for this cause.

"The history in France has been repeated, I believe, from such data as are obtainable, in Austria, Hungary, and Russia, and to a less extent also in Germany. England alone has not suffered to any great degree, and this is because, first, of the low prevalence of the disease in

* Biggs, H. M. Am. Review of Tb., 1917, Vol. I, 257.

the civil population of England previous to the war; second, because the army was mobilized deliberately, and careful physical examinations were made, and those applicants who had suspicious histories or signs were excluded; and, third, because the English troops live under distinctly better conditions at the front than do the French, because as a nation they are fond of fresh air and outdoor life.

"The contrast between the present situation with reference to the tuberculosis problem as it exists in England and as it exists in France is most striking and instructive. France has suffered from the war infinitely more than England has thus far. Still Great Britain has raised an army of over 5,000,000 men, and no new or serious tuberculosis problem has been created. France, on the other hand, has a problem of such magnitude that it threatens even the future vitality and economic development of the French people. In England the tuberculosis problem has been efficiently met before the war; in France, on the other hand, practically nothing had been done. It is not, therefore, because measures for the prevention of tuberculosis are wanting or inefficient that tuberculosis has become such a serious problem in so many European countries, but it is simply because the well-tried measures have not been applied, both before and since the outbreak of war, in an efficient way."

This surely is sufficient evidence that it is our patriotic duty to protect the health of the people by a properly organized anti-tuberculosis campaign. The results of inadequately handling the problem, or leaving the matter to private effort, is well illustrated by Dr. Biggs's report of the appalling conditions in France at the present time. As a result of his report legislation has been recently passed in New York State making it compulsory for every county having a population of 35,000 to provide hospitals or sanatorium beds for the treatment of tuberculosis equal in number to the death-rate in that county from tuberculosis. It is the imperative duty of this Province to adopt such well-tried measures as have proved effective in England and other countries. Let us cease trifling with this problem, and let not future generations reproach us that they knew but did not act. With our splendid climate, our uncrowded cities, and our young prosperous people, there is no reason why we should allow the matter to drift until we have the enormous problem upon us that they have in some of the older countries of the world.

To carry on any effective campaign against tuberculosis in this Province means the expenditure of a large amount of money. It is much more than can be done by private philanthropy. Private philanthropy has been the pioneer, but it is now time the Province should act upon the knowledge already gained.

Public health is a purchasable commodity. Let the public understand that, once and for all time, and there will be no objection to the Province preserving for the people that which money cannot restore to them when lost.

Discussion on Dr. Vrooman's Paper.

The Chairman: I am sure we have all listened to this paper, this very valuable and instructive paper, on the question of tuberculosis which Dr. Vrooman has so ably put before us, and we are particularly struck by the fact that for once we are running down some method of prevention; but I am not going to speak on this at the present time; I wish to call on President Wesbrook to open the discussion. I would also ask all those who take part to give their names and places of residence so that the stenographer may take it down, and also speak on one side of the room, or in front here, so that all can hear.

Dr. Wesbrook: Mr. Chairman, Ladies and Gentlemen,—I wish first of all to congratulate myself and all of you upon having had the privilege of listening to Dr. Vrooman's paper. It is emphatic; it is clear; it does not advocate new and untried methods; it is a vindication of the practices which have been adopted, first, from a financial standpoint, and, secondly, backed up by Government in many countries of the world. Dr. Vrooman quoted Dr. Hermann Biggs a number of times. Dr. Biggs did more, I think, for municipal health, particularly in regard to tuberculosis, than any other one single individual in the world so far as I know. You may recall that in the early nineties, in order to get the people educated on tuberculosis and in order to stimulate an interest, sputum examinations were begun by the New York Health Department. They were made free. I remember at the time many people who had made themselves skilled in this kind of work used to protest against the city doing it for nothing, because it would interfere with the practice of medicine in that regard and interfere with fees. As a result of that, however, gradually the people and, still harder to do, the profession were educated as to

the economic and social importance of tuberculosis. We in the profession for many years had believed that every place in which medicine entered was holy ground, and that nobody was capable of understanding it unless he were a medical man. Gradually in New York they were able, through this publicity, to locate tuberculosis that otherwise would not have been located, and finally to make it a reportable disease, which completed the census of tuberculosis. That is the kind of thing that Dr. Vrooman is advocating for us here. Very aptly, I think, he pointed out the peculiar nature of tuberculosis, referring to its pathology and to its chronicity; to the fact that the tubercle bacillus had a double effect, one of stimulating tissue-growth, the growth of ordinary tissue, and of connective tissue, and when in large quantities at present it has a capacity of breaking down tissue. Now, these two processes are going on all the time, and the treatment of tuberculosis is based upon that; that is, the building-up of the system and giving nature a chance to wall in the infection. However, the tubercle bacillus is a long-lived bacillus. It is extremely resistant; it has in its envelope a very resistant material, and it may remain alive, if not actively growing, for months and for years. Now, this proves a hardship—at least, makes the difficulties greater of dealing with tuberculosis; but, on the other hand, it gives a chance to save the individual, if not whole, at least to save him if we find out in time that he has tuberculosis.

Dr. Vrooman pointed out very clearly to us that every one of us has at some time been struggling with tubercular bacilli in smaller or larger numbers. When the test first came out it was very discouraging to find that it was of value only in children, and we all reacted on this test after we got to a certain age. I was reminded, as he read his paper, of what I heard Osler say one day. Simon Flexner, before he went to Philadelphia and before he went to Rockefeller Institute, used to be at Johns Hopkins, and he was conducting an autopsy in order to find out the cause of death where the patient had died of something else than the diagnosis. At the time it was not thought it was tuberculosis; they didn't know what it was. It was a very interesting case, but, as Kipling says, that is another story; it was published later. I happened to see the first autopsy as the lungs were being examined, freely cut into, an old place—I forget whether it was calcified; I don't know; but while Flexner was conducting it Osler said: "Oh, we all have them." Well, that was very startling at that time. There were very few people who would have been as frank about it as Osler was; but that was true; they had to struggle with the tubercle bacilli, and in hundreds of autopsies on adults you will find a very high percentage—perhaps you placed it too high, Dr. Vrooman—well, it is probably safe; and you will see evidences of a struggle with tubercular bacillus. Now, that gives us our chance, while it makes for us also a very difficult problem, because you never could know when the battle has been won. It makes it all the more important, however, that we should have early diagnosis; and in order that Dr. Vrooman's plans, which are admirable, should be successful, it means that early diagnosis must be made, and it means that those who are capable of making them should be available.

Now, the physicians in this room are probably not very different from the physicians throughout the world, and in my experience probably not over 3 or 4 per cent. of the ordinary practising physicians, or physicians as they run, do make—I don't say they can't make, but they do not make diagnoses of incipient cases in many instances which come before them. Now, for Heaven's sake, we in the profession ought to be able to make a diagnosis long before the people on the street can. We don't want any curbstone diagnosis, across-the-street diagnosis. Temperatures, night-sweats, loss of flesh, cough, hæmorrhage—some of these things, the laity can make a diagnosis under those circumstances. Now, we don't give ourselves or the patients a chance if we don't do it. I know that great pressure is brought to bear upon the physicians; when a patient suspects that he has tuberculosis and goes to a physician, he is afraid; but if somebody will just take a good look at him, possibly look at his tongue and pat him on the back and say, "You are all right," that patient is very happy—used to be; but remember now that with this new axiom, that public health is a purchasable commodity, the people are taking a great interest in health and the principles which underlie it, and we are expected to be able to explain our problems in their language and to justify our decision. Now they are beginning to realize that when they go into a doctor's office to be examined for tuberculosis they may be stripped, and that an examination is to take some time; and many of them know about X-rays, some of them know about tuberculin, and they all know about the use of the stethoscope, percussion, and all that kind of thing. Now, it is no wonder that the people who are engaged in

the practice of medicine, and who have to deal with all of these branches, in certain of them are not expert. Now, I have a reason for speaking on this. I believe very much in Dr. Vrooman's idea. I believe that we should have the best possible expert in the service of the Government at the head of this tuberculosis movement. I don't believe, however, that we need local ones; and this war has upset all of our calculations. Before the war, as Dr. Vrooman has pointed out, experts on tuberculosis were extremely scarce, and now with the lighting-up of these cases, due to exposure and to bad physical conditions—because we have them in Canada as well as in France. We haven't any 400,000 or 500,000 as Biggs estimates for France, but we do have a good many cases which have escaped the attention of the examiner for overseas service, and have been lighted up since. We do not sleep so many people in an underground hut; we believe in fresh air, and have gone in for outdoor exercise, and so on, as Dr. Vrooman has pointed out; but we have an increase in tuberculosis, and it seems, as a war measure alone, any nation might well spend, and it would be real economy, a great many thousands, hundreds of thousands, millons of dollars, because every soldier, potential soldier, who is kept fit in this way is a decided asset. That is equally true of these times.

Now, to get back to the point to which I was referring to a minute ago: Why would it not be possible—I don't know whether Dr. Vrooman could do it if he had more assistants—and I am able to say that he needs more assistants. He didn't know I was going to say that, but I say it now; I have been up there and he does need more assistants. That ought to be arranged so that all of us could avail ourselves of his special knowledge. Why wouldn't it be possible, say, to begin in Victoria, Vancouver, New Westminster, and some of these other places, and have Dr. Vrooman, or other experts if we have them, begin a little dispensary clinic. It would do two things—you would get a lot of cases if it were advertised, we could bring in a lot of cases we didn't know about; on the other hand, if the profession would co-operate, we would be getting a good many other people around us who are experts in this. I don't know whether Dr. Vrooman gets them or not; I suspect that he gets a good many cases sent up to him which might have been diagnosed as incipient cases a good many months and, in some cases, years before he gets them. Now, that is true in other dispensaries. It is true all over in every place that I know anything about; and I do think that we are going to save ourselves money; we are going to save the country many lives, we are going to save a great deal of suffering if we can get these diagnoses made earlier.

I believe in the idea of the district nurse. I wish I could have had a chance yesterday of discussing the paper on "Medical School Inspection." I am a very great believer in it. You can't sit around, doctors can't, and wait for patients to come to them. The city has to go out and seek the sick, and there are many ways of doing this. The chief way perhaps is school inspection, and that will not be efficient unless it is seconded by visiting nurses. Very often the absence from school of a child will give you a clue to some illness that you would not otherwise have found, particularly if you are able to send your nurse out to the home and see about it. Now, that is a good thing in the city; it is a more necessary thing really in the country. Now, I would like to speak most enthusiastically and to speak at some length, but I think perhaps some of us in talking about these matters will suggest to Dr. Vrooman, or may directly ask him questions; and I think that Dr. Young, who got this meeting up, is to be congratulated that tuberculosis, always an important matter and during the war a very important matter, was so strongly featured on this programme, and I think it is a great privilege that I am allowed to be here and have an opportunity of getting back again into touch a little with the work of public health, which meant so much to me for such a long time. I thank you. (Applause.)

The Chairman: Dr. R. E. Walker.

Dr. Walker: Mr. Chairman, Ladies and Gentlemen,—I would just like to add a word in praise of the very excellent paper which Dr. Vrooman has communicated to us to-day. His wide experience on this subject always makes anything that he may say instructive, and it carried with it belief on the part of these who may have the privilege of hearing him. In his remarks Dr. Vrooman mentioned several points which to me, as a general practitioner, were particularly interesting. Firstly, with regard to bronchial-gland infection which Dr. Vrooman mentioned, I think that very few practitioners fully realize the frequenecy and the importance of bronchial-gland infection in children. So many children are brought to the practitioner complaining—the parents say they are not up to the standard, they are below par, they are run down; and very often, I think, the general practitioner is satisfied with this diagnosis; he does not investigate

the case thoroughly, and they are allowed to drift along by themselves with a drink of tonic or something of that kind; but a true diagnosis of the case is often not made.

When I was in Eastern Canada not long ago I visited several of the tuberculosis clinics that were conducted by the various cities there, and I was much struck by the thoroughness with which these children are examined and a true diagnosis come to. All the children admitted to these clinics are given a tubercular test, and then they are X-rayed, and great reliance is placed on the taking of the X-ray. If the disease is active, in Toronto and Montreal both, they have very excellent sanatoriums close to the city where these children are placed. The Toronto one is quite an extensive institution, and they are kept there for varying periods; they are given suitable treatment, and open air classes are conducted, open-air schools are conducted with these children in attendance, and the result is very satisfactory in connection with that. I think, if the general practitioner were more alive to the fact that bronchial-gland infection is so frequently a case of sickness of an indefinite character in children, we would get much better results than we do.

Then, again, Dr. Vrooman stated, with regard to pulmonary tuberculosis, that often the disease can be diagnosed from clinical symptoms alone. In this I quite concur. I think it is much easier for an inexperienced practitioner; that is, one inexperienced in making physical examination and diagnoses of incipient tuberculosis from clinical symptoms than it is from the physical examination; and in this connection I would like to draw attention to what I have found. We have heard Dr. Vrooman say that patients have frequently told them that their doctor said there was nothing wrong with them; that is, nothing wrong with their lungs. Well, I find that patients place an undue reliance on the physical examination. The stethoscope is a sort of mysterious instrument to them, and they come into your office and they consult you, and all they want is an examination. They come in and they don't want, very often—don't want to be questioned. The first thing they want to do is to strip off their clothing and have their chest examined; and no matter what you may say to them or what you may think, you may tell them that they are tubercular, but if, unfortunately, at the same time you tell them that you have not been able to get any physical signs, as perhaps an inexperienced man—when I say inexperienced, a man who is not expert—he is not able to get physical signs, that is about all they pay attention to; and you may assure them that they are tubercular, but if you incautiously say at the same time that you have not been able to get any physical signs, anything wrong in their lungs, they go away quite happy and satisfied that they haven't got consumption, as they generally call it. So that I think more caution should be exercised in telling patients what the condition of their lung is; that is, if the doctor does not find physical signs, he should be very careful at the same time to impress upon them that, although the physical signs are not there, or that he cannot detect them, still they are tubercular. He should certainly impress upon them that they have tubercular trouble in the lungs, although it is not to his ear or under his examination discernible.

With regard to the question of the immunity of England from tuberculosis, I happen to have read—I think it was an article by Dr. Biggs, whom Dr. Vrooman quoted, and he suggested in this article that the immunity of England from tubercular trouble was purely the result of accident, in this: that many years back it had been the custom for indigents to be placed in workhouses and poorhouses; long before the tuberculosis was recognized as an infectious disease, long before it was even diagnosed, these unfortunate persons soon became indigent and were placed in infirmaries. In this way segregation of advanced cases was made long before it was considered necessary to separate them they were separated, perhaps to the detriment of a good many of the other patients in the infirmaries, but it had a good effect on the community at large; and it is to this segregation, at first purely by accident, that England now is so immune from tubercular trouble.

This, I think, has an important bearing on the whole question, for although this very segregation was extended, it shows, it teaches us a very important lesson, that we might learn the value of segregating advanced cases; and my own opinion is that all advanced cases should be treated in hospitals. I do not think that any advanced cases can be properly treated in their own homes, because when they become advanced they are more or less helpless, and no matter how well they understand, how well they may be taught the necessity of taking care of their sputum, and that kind of thing, when they are very sick they become careless, and their friends become careless, and I don't think that you can ever treat an advanced, open case of tubercular

trouble anywhere but in hospitals. I think that that is a very important thing indeed, because it is through these advanced cases that the infection of tubercular trouble is being largely spread among the children and the non-infected persons in the community.

With regard to the question of dispensaries, I think that is, of course, an excellent plan. It is a plan that is being adopted everywhere. There may be some difficulty in the country districts. The idea that suggested itself to me was that possibly, through the aid of the Victorian Order of Nurses, we might get some assistance. I know I have found these ladies connected with this organization of inestimable value in general work. They are well trained, they seem to have been selected very wisely, and are as a rule a very intelligent, able body of women; and in the country districts I think possibly their services might be enlisted in connection with visitation, home visitation of tubercular cases, as suggested by Dr. Vrooman. I thank you, Mr. Chairman. (Applause.)

The Chairman: Major Proctor will now speak on this subject.

Major Proctor: Mr. Chairman, Ladies and Gentlemen,—I will only occupy a very few moments. I want to add my testimony to the great pleasure with which I have listened to Dr. Vrooman's admirable address on this subject. Dr. Vrooman has given you in his paper the theory of this subject. I know something about Dr. Vrooman's work and practice. He is too modest a man, of course, to tell you what excellent results he is getting and the work he is doing at Tranquille. I know I have thought that sometimes, as one who has been interested for a long time in this work, that part of the indifference of the general public—yes, and even of the medical profession—has arisen from the idea they have of the apparent hopelessness of doing very much with a tubercular patient, an idea which is absolutely erroneous, an idea that is almost cruel. I should like to tell you, along the lines that I have heard a moment ago, of the excellent work that is being done up there at Tranquille by Dr. Vrooman and his staff. I think that every Health Officer who has the interest of the general public at heart should know. Out of twenty-five cases that went there, and who were afterwards discharged as cured from that institution—a small institution, an institution that has been struggling along against great odds, the want of the necessary money—it cost, that batch of twenty-five patients, it cost about $6,000 to look after them and discharge them as cured; and from the date when these twenty-five patients were found, who were discharged as cured and whose cure cost $6,000, they had earned some $65,000 in wages since their discharge. That, I think, ladies and gentlemen, is a result worth talking about; it is a result worth knowing. (Applause.)

This war has taught you and me a great many things. It has taught us, I think, perhaps above everything else, the value of physically fit people among those of us who have been talking about health problems for several years. We have been talking about tuberculosis, and we thought we might be accused of driving a hobby almost to death. I think, ladies and gentlemen, that this war has absolved us from that charge; and you know that is of supreme value to you and me to-day as a nation to be a physically fit people, and no money that is spent in that way I think is money wasted. I find that since this war started, and since it has gone along and we have seen in the papers from time to time the huge amount of money that it is costing us to finance this war, although we have not been able to convince our Governments that they could spare the money to properly look after the indigent tubercular subject. Now, in our Dominion I think we now realize, ladies and gentlemen, how well spent that money would have been.

Now, I am not going to keep you, because the hour is getting late, but Dr. Vrooman's paper, of course, points to a practical model of what is to be done. It resolved itself into two phases—treatment, which I do not intend to go into, he has gone into that so well; and the prevention which is the important thing. The care of advanced consumption, which, of course, is dangerous consumption, is of pre-eminent importance, as has been shown by Dr. Wesbrook, Dr. Vrooman, and Dr. Walker. We physicians see a good deal of advanced consumption. I see a good deal of it in this city; unfortunately, up to date there is no proper means of handling such a case. Suppose we have in this city, as we have, indigent consumption. We know their home; we have no means of taking hold of that man to handle him and put him into an institution and keep him there. I could give you instance after instance of what happened. Not so very long ago, about a year ago, an advanced consumptive was discharged because he wanted to go; he wouldn't remain any longer in our hospital up here, the Vancouver General. He spent the next succeeding five months in being a waiter in one of your restaurants in this city. Then when he got too sick

to carry on he returned again to the Vancouver General Hospital. And that, ladies and gentlemen, for that we have absolutely no means of handling it to-day, handling that problem. Another case that I saw this week has been in two sanatoria in this Province. He returned because he wouldn't stay there. We had no power to keep him. He refused absolutely to go to the Vancouver General Hospital. Now, that is the important thing. We want a place where we can keep subjects of that type, where they can keep them in a ward. The result is he is staying with many others in a rooming-house in this city, infecting others with the same trouble. That is a problem that confronts us, and it is one of the most serious kind.

We had a clinic in this city, a clinic that was established years ago by the enthusiasm and the interest of the women of our city, a clinic that I think has shown excellent work; and the problems that present themselves to those who attend that clinic are many and varied. I must not talk too much, but I just want to say this: Take, for instance, a case we sent up to Dr. Vrooman at Tranquille, the mother of a family. The mother goes there; perhaps she is an advanced case; I have two families of that kind where the work of these households is being carried on in both these instances by girls, children of fourteen and fifteen. Those children are housekeepers; there is no money to do anything else. They are living in the same surroundings and under the same conditions as the mother who has been to the sanatorium, and perhaps died; and they have no present facilities for doing anything else; and yet those children will be the very ones who will develop this disease if they are not placed in proper surroundings, if they don't have to go to work, if they are not able to get the proper food that they require, and the amount of fresh air. I believe there is a movement on foot in this city, and I may be able to tell you it may—I don't know that it will be, but it is talked about being undertaken, under which in this city a children's institution for suspect and others who have tuberculosis, the kind of people who will develop tuberculosis if they are not particularly looked after. The trouble with meetings of this kind, the trouble with papers of this kind, ladies and gentlemen, is that too often a remarkable paper like Dr. Vrooman's is listened to with delight by everybody present, but nothing practical results. Now, what I should like, if possible, would be that you should authorize the Chairman of this meeting, say, to appoint a small committee to bring in recommendations to be sent to the proper legislative authorities, the recommendations being a result of what you have listened to here, with the hope that something practical may be the result of the delightful paper and the presentation of the subject such as you and I have listened to from Dr. Vrooman this morning. (Applause.)

The Chairman: Ladies and Gentlemen,—We may congratulate ourselves on having with us to-day the Provincial Secretary and Minister of Education, Dr. J. D. MacLean. I know he is with us in his interests as a medical man with regard to this subject, but I think he will go farther still and make the best endeavour to get the necessary money to carry on this warfare which is being carried on by Dr. Vrooman against the white plague. I will ask Dr. MacLean if he will kindly say something on this subject now.

Dr. MacLean: Mr. Chairman, Ladies and Gentlemen,—I assure you that it indeed affords me a very great deal of pleasure to be present here to-day, and the pleasure is enhanced owing to the fact that you are discussing the problem in which I have always been very greatly interested, and that is the problem of tuberculosis and the prevention of this disease.

Before taking up any discussion on the question, I wish on behalf of the Government to thank the men and the women who have come here at a sacrifice of time and energy to discuss a question of this kind. It speaks well for your loyalty to the Province, and it speaks well for your interest in the future welfare of the Province that you have come here in such numbers, many of you at considerable expense; and we all know, those of us who have been engaged in the practice of medicine, that time away from your office is absolutely money lost; so that I say that you are to be congratulated for the sacrifice that you have made in this connection.

Now, I do not appear before you to-day at all as an expert on the question of tuberculosis. As probably some of you know, for the last ten years I have been engaged in the general practice of medicine in a rural community, or at least a community which was largely rural, and the question of turberculosis as it affects rural districts, of course, came largely before my mind and to my attention, and it seems to me that it is in the rural districts, in the outlying districts, that the problem is the greatest. Those of you who have practised medicine in the outlying districts realize the difficulties under which the general practitioner labours. For instance, you get a case of tuberculosis. You have a small hospital, probably anywhere from ten to twenty beds, and to

begin with, the hospital authorities are not very anxious to take your patient in, for the simple reason that if the news gets spread abroad that there is a tubercular patient in your hospital, why the other patients in the neighbourhood, who would naturally go to that institution, do not want to go; consequently the hospital authorities—and this is not because they are not convinced of the seriousness of a case of tuberculosis, but from purely financial considerations. A hospital cannot be conducted without money, and if you have your patient in there, a tubercular patient, the majority of people are afraid to have a patient go into that hospital; consequently the problem is a very difficult one there. And in addition to that you have the fact that it is so difficult to convince the people that there is a case of tuberculosis in their family. Various considerations arise, most of which are uncalled for. They seem to think, the average individual, that there is some kind of disgrace attached to the fact that there is tuberculosis in the family. These are difficulties which have to be met in the outlying districts.

I was particularly pleased with Dr. Vrooman's paper, and the particular feature that appealed to me in it was the entire practicability of the paper. The suggestions that he made were not purely theoretical suggestions; they were suggestions that are absolutely carried out in private practice, in the practice of medicine in this Province. And I was particularly pleased with it for another reason, and that is that it went very much along the lines of the suggestion and the ideas of the Health Department in Victoria and myself, in discussing what could be done, and what should be done, or what might be done in the fight against this disease. I say it was very much along the lines that we happened at Victoria to consider wise. However, I do not wish at all to take any credit away from Dr. Vrooman for his very excellent paper, and while we have many of the ideas that he has, he has succeeded in systematizing and in placing them in a practical light which will be of very great assistance to us in our endeavours to have some solution toward the working-out of this very great problem.

Now, I wish to assure the medical men and women who are in attendance here to-day, and the others of the audience who are interested in this work, that we in Victoria are deeply interested in this question of public health, and, in particular, in the question of the prevention and spread of tubercular disease. You know it is rather a large question, and you know that Governments are traditionally slow in moving, and you will have to take all that into consideration when you are looking for some results, or for results of this meeting, as suggested this morning; but I wish to assure you that we are seriously intending to grapple and are grappling with this question to-day, and laying out plans in order that we may be able to do something towards preventing the spread of this disease. It has always struck me as being rather remarkable that a disease like scarlet fever, say, or smallpox, how all the forces of Government, whether municipal or Provincial, when a case of scarlet fever appears in the community, all the forces of the Government are directed in one way, and that way is to segregate that case of scarlet fever, to prevent the spread of the disease; but in a case of tuberculosis in the community, which statistics show is many many times more deadly, very many more deaths from tuberculosis than there even begins to be from scarlet fever, the cases of tuberculosis walk around to spread the disease to and menace continually their associates, and yet nothing is done. So the great question to my mind, the great problem to my mind, is the question of arousing the public to the very great danger of having those active cases of tuberculosis walking around our streets.

I do not wish to say any more, Mr. Chairman; I wish to thank you for the invitation to be present here this morning and to make a very few brief remarks. I do not wish to take up time which can be very much better occupied in listening to those who have a real practical knowledge and a working knowledge of the subject under discussion. I thank you. (Applause.)

The Chairman: Ladies and Gentlemen,—This subject is open for discussion, for general discussion; but I warn you that the time is getting on, and we have two more important papers, and we have yet to have an address from Dr. MacLean to be delivered later on. He has just spoken a few words on the subject of tuberculosis. Now, I hope any one who wants to speak will get up and speak quickly on the point, and distinctly.

Dr. MacLean: Mr. Chairman, I wish to correct your reference to the address that I was to give. Those of you who have been engaged in the practice of medicine realize how oftentimes the very best plans that you may make will go wrong; and, while I am not engaged in the practice of medicine now, I am engaged in work that is fully as jealous of one's time as the practice of medicine, so, as they say when they get in a hurry in some meetings, we will have

to take the paper that I was to have given to-day as read; so that if you were expecting any particular paper from me, I am very sorry that I have not been able to give the time and attention to the preparation of such a paper.

The Chairman: Any further discussion on this subject? Any of you who wish to say something, do not delay.

Dr. Wesbrook: I don't wish to speak twice, Mr. Chairman; but something has occurred to me, and that is that I failed in my talk before to express appreciation of the wonderful work that Dr. Vrooman is doing; and I wonder how many of the Health Officers and medical practitioners and others who are here to-day have visited that institution. I would like to suggest that that is one very good way of seeing modern tuberculosis work; and we have it, as you have gathered to-day from skiagraphs exhibited here, we have it in this Province in as up-to-date fashion as we could wish.

I would like also to suggest that when Dr. Vrooman closes the discussion, if he will kindly do so, he will tell us a little something about the special tuberculosis school which is being run at Saranac, just a few words, because some of us may wish to avail ourselves of Dr. Vrooman's help, and I hope we all will do that; and some of us may wish to get a little further expert information, and he can tell us all these various particulars.

W. J. E. Biker, C.E. (District Engineer, Nelson): I, like Dr. Wesbrook and others who have spoken previously, congratulate myself on hearing such a very explicit paper as we have had this morning. I would like to elicit from Dr. Vrooman a few practical points on the living conditions of the people. I am speaking as a layman and as an engineer, therefore I hope you will bear with me. I feel rather out of my atmosphere with so many doctors present, but the living conditions of the people must have something to do with tuberculous cases. I come from the Upper Country; I work up at Nelson, District Engineer for the Government, and my work takes me a great deal into the mining and logging camps. Now, particularly mining: I would like to ask Dr. Vrooman if he has any percentage of the cases that come under his control that come from mining camps in this Province, because in camps I have noticed buildings from 18 to 24 feet long and 6 feet high at the eaves, from thirty-two to thirty-six men sleeping in one room, and with very little ventilation at that. There was another point I would like to ask, and that is this: The immunity that England finds herself in from tuberculosis, is it entirely due to the methods that have been used in attacking this disease, or is it in some measure due to the improved sanitary conditions? Those are points that I would like to hear Vrooman on.

(At this point Dr. Wrinch substituted in the chair.)

The Chairman: Is there any other discussion? There are some who wish to hear from Dr. Underhill.

Dr. Underhill: I think, Mr. Chairman, as the time is getting on, I can add nothing more to what has already been said, but the only question I would like to ask Dr. Vrooman, in answering the remarks on his paper, is to deal with surgical tuberculosis, the methods and the means he would adopt for dealing with this question. I think that is something that is of great interest to all of us, especially at the present time.

(Dr. Underhill resumes the chair.)

The Chairman: If there is no further discussion I will ask Dr. Vrooman to reply.

Dr. Vrooman: Mr. Chairman, Ladies and Gentlemen.—I wish to thank you for the very kindly way that my paper has been received. There is nothing in it but what you will find in the literature on tuberculosis for the last five years. I have tried to give you what are the well-established views, and my hope is that it may have some practical effect. In reference to a point raised by Dr. Walker, the patients are too ready, I quite admit, to say there is nothing wrong. I have had patients in and out of my office in the sanatorium, coming there and telling the other patients that I said there was nothing wrong with their lungs, when I told them, though not definitely, that they had tuberculosis, but not much. This has happened more than once at the sanatorium, so I quite realize that it is going to happen many times in private practice, and it means that we have to be careful.

I would like to hear mention the good work that has been done by the ladies of Vancouver in connection with the tuberculosis clinic. It has been a pioneer and it is leading the way. The only difficulty they have laboured under with regard to it is the lack of money. They have only had one tuberculosis nurse in Vancouver when they should have had three, and they haven't had any place to put the patients when they discovered them; but they have done good work,

they have helped us in the sanatorium, they have helped to look after cases here, and I cannot pay too high a compliment to the ladies and the nurses who have been in charge of the clinic. Now, I only hope that the work will be extended much farther.

Dr. Proctor referred to the incorrigible patient. We have to handle these in a special way, and New York handles them in a special way; they have a special place for them on one of the islands in the East River, a special hospital where the incorrigible patient who will not stay in the sanatorium, who will not obey the rules while in the sanatorium—there is a small percentage of these anywhere; and in New York City it is recognized, and they have established a separate institution for that purpose where they are committed by a Magistrate, those who are absolutely incorrigible, and most of them are drunkards and absolutely careless. They are committed, and they are allowed privileges only under conditions of good conduct. I think for that class something like that will have to be done, because there is a small percentage of what you might call indigent drunken, open cases of tuberculosis.

The problem that Dr. MacLean has mentioned of the rural districts is a considerable one. The smaller hospital can hardly handle tuberculous cases, and that is the reason why I say that the sanatorium at Tranquille will still have to handle a certain number of advanced cases, because these rural hospitals cannot under many circumstances take them in. It is only in the larger centres like Vancouver and Victoria where they would have the separate hospital.

I was very glad to hear also that the Government is now going to act. We hope to see that the action means the voting of a large sum of money to be devoted to this purpose. That quotation was from Dr. Biggs, that health was a purchasable commodity, and if the Government of British Columbia wishes to purchase immunity from tuberculosis, well, they can purchase it, and I hope to see that they will do so.

I do not think that the public are fully aroused on this question. If I might be allowed to make an observation—because perhaps I come in contact with the public in some ways more than the medical practitioner, and they express their feelings—if I might decide my own profession, right in the family the public are even more aroused on this question than the medical profession or the Government. That is my own observation, but I believe that it is correct.

There is a standing invitation for all practitioners of the Province to visit the institution. Too few have availed themselves of it. We will make you welcome if you come and stay a day or a week; we will try and fix you up; and we will give you any opportunity you wish to study tuberculosis there, what we can do, show you what we are doing.

The Saranac School has been recently established. It is called the Trudoff Outdoor School in memory of that great pioneer in America, Doctor Trudoff, who established the first sanatorium in America. In memory of him they have built that Trudoff School, which is under the direction of Dr. Baldwin, probably the leading man on tuberculosis in America, and they conduct tests in the schools for six weeks dealing with the tuberculosis problem, and my assistant, Dr. Gilchrist, had the privilege of attending that school this summer, and I have greatly profited; he profited by it and I have profited a great deal through him in the teaching of the methods that he learned at that school; and if any of you can afford to do so, even if you cannot spend six weeks, if you will spend a week at Saranac in visiting their improvements, you will find them all royal fellows there. The tuberculosis specialists are only too ready to give you everything as accurately as possible, if you wish to learn. And even if you cannot go to the school, if you are in Eastern Canada and would visit Saranac and see some of the methods there, and visit the laboratories, you would see something that is being done and get a glimpse of some of the problems that come up there. They are doing a good deal of research-work that is being done.

In reply to Mr. Biker, in reference to the effect of mining, we do get quite a proportion of miners. I haven't got any figures here—not so much among coal-miners, although we do get some coal-miners; but, of course, the dust of the quartz-mine is more irritating and more apt to set up tuberculosis. I think that living conditions in the camp may have something to do with those symptoms.

In reference to Dr. Underhill's question as to surgical tuberculosis of children, I have a vision—I don't know whether it will ever be realized—of seeing an institution at Tranquille which will handle all forms of tuberculosis, surgical or otherwise; that we will have there an institution that we can both give the open-air treatment, and can give, if necessary, surgical treatment to children under practically what is the best kind of conditions, such as they have in Saranac. We haven't taken any of these, but they do, and they do exceedigly well under

sanatorium conditions after they have received the necessary surgical treatment. The doctor just gives you a glimpse of what you need, and in thanking you for the way you have received my paper, I hope that it will give you that, and that something may come of a practical nature from it; that we will do something for these sufferers from tuberculosis. I could keep you all morning telling you of pathetic cases, but I am not going to, any further. I thank you, ladies and gentlemen. (Applause.)

The Chairman: The next paper, "The Laboratory in Relation to Public Health," by Dr. Wesbrook, President of the University of British Columbia. Evidently some special privilege attaches to being the President of the University, as he is able to find a substitute. Many of us would desire the same thing when we are called upon to write a paper, but Dr. Wesbrook will kindly introduce the substitute for this paper.

Dr. Wesbrook: I feel, Mr. Chairman, very much like a pretender. I have been very much embarrassed by the fact that my name should have appeared as the reader of this paper, but you have given me the privilege of explaining. At the time Dr. Young was getting up the programme he wanted a paper of this kind, and I volunteered; but just shortly after the arrangement was made a man who was very much better able to give it than I, a man who is in that work and has been in that work for a good many years, decided to come to this Province, and has assumed directorship of the pathological laboratories of the Vancouver General Hospital and is responsible for the teaching of bacteriology in the University this year. This is a composite arrangement which is, I hope, not cutting through the lines of co-operative work which in the University we will be free to undertake. If I might, in the opening of the discussion, speak to this, I will be glad to do it. This, you will observe, is also taking another privilege; that is, inviting myself to discuss Dr. Mullin's paper.

Dr. Mullin returns to Canada; he has made a place after a good many years in the States. Dr. Mullin is a graduate of Toronto University in Arts and Medicine, worked there in the public health as assistant to Dr. John Amyot, whom you know is another of those who are mixed up in the war. In parentheses I might say that Dr. Amyot and his three sons are all at the front at the present time. He had, too, I think, to misstate the ages of some of these sons in order that they might go. Dr. Mullin has practical experience in the Toronto General Hospital as a member of the hospital staff, was interne there—or house officer, as we call it—and also at Kingston, the Hospital for the Insane. Then he spent—well, a number of years in Minnesota in the University of Minnesota and in the State Board of Health. Dr. Mullin and I were associated together, I think, for nine or ten years, and he was my successor as director of the Minnesota State Board of Health laboratories. He has had a very wide experience in pathology and in bacteriology, and I regard it as very fortunate indeed that you are able to get his services in this Province. He will speak to you upon this problem of the laboratory in relation to public health, and if I may crave the privilege, I should like to discuss it and certain things which arise out of it, later. I shall ask, if I may, Mr. Chairman, Dr. Mullin now to give his paper. (Applause.)

THE LABORATORY IN RELATION TO PUBLIC HEALTH.

By R. H. Mullin, B.A., M.B., Laboratory Director, Vancouver General Hospital.

Within the present generation medicine has become a highly specialized science, due to the rapid advances that have been made through scientific methods. No longer is it possible for a single individual who used to be called the family physician to be familiar with all methods which are employed in the various branches of medicine. This family physician has been supplemented by groups of individuals whose work is more or less restricted to one particular branch, and who are known as specialists in that branch, so there are surgeons, internists, gynecologists, etc. Not only has there been specialization in these various branches, but each branch has become further specialized into the clinical and laboratory science.

During the process of this specialization a comparatively new science has developed—namely, the science of public health or public medicine. It is necessary to differentiate clearly between the practice of public health and the practice of private health if an adequate idea is to be obtained of public-health laboratories. Private health is what is more commonly known as practice of medicine, is essentially individualistic, and is an attempt to cure an individual of some disease for his own particular benefit, without regard to the bearing it may have upon the community as a whole. Public health, on the other hand, deals with community health and

welfare, and seeks to promote this by the prevention of disease, and by devising methods for the promotion of the welfare of the community as a whole. In the one, individuality and cure are the predominating notes, while, in the other, community and prevention.

It is not so very long ago that public-health workers were selected without regard to previous training from the ranks of practising physicians; now it is becoming realized that for the successful practice of this profession trained specialists are necessary. Just as in the development of the practice of medicine the necessity of trained laboratory workers soon became apparent, so, too, in the practice of public health this side of the science is becoming recognized. It is necessary to differentiate between a public-health laboratory and a clinical laboratory, and to appreciate that the two are essentially different, and that it is not necessary that a good clinical-laboratory man must be an equally good public-health laboratory man. The two services are just as different as are public and private medicines.

The function of public-health laboratories may be briefly stated to be: (*a*) To assist in the prevention and control of disease; (*b*) to devise means for adding to the comforts of community life; (*c*) research; (*d*) education. The laboratory-work in the prevention and the control of disease falls naturally into three subdivisions—control of communicable diseases, supervision of public water and milk supply, and the investigation of foods and drugs. In some communicable diseases it is possible to demonstrate the infectivity of individuals by laboratory methods, and so determine that such individuals are a menace and danger while taking part in a community life. It is also possible in certain of these diseases to determine when individuals who have been infected cease to be a menace, and so accurate means are afforded for determining the time at which they may be permitted to resume their community activities. The laboratory may also provide certain biologic products which may be used to artificially immunize individuals in the community, so as to decrease the probability of their being infected; also to effect a cure when infection has occurred. This class of laboratory-work is accomplished in what is called a diagnostic laboratory. Of recent years it has become more generally appreciated that this diagnostic-laboratory work should be undertaken in close association with field investigation in communicable diseases, so that there is gradual development in different localities of what are called bureaus or departments of communicable disease, in which both field and laboratory investigations are made in order that all of the information related to a particular epidemic may be in one branch of the service.

The scope of the work of a diagnostic laboratory may be broadly stated to be all laboratory-work that can be of any service in the control of communicable diseases. This is naturally limited to such of these diseases as have a known causative agent, but there should be no limitation as to the character of the examination that should be made where this agent has been identified, provided only that the examination will indicate the presence of infected individuals or assist in preventing the spread of the disease. From a legal point of view a communicable disease is one that is reportable, but in some instances it may be advisable for the laboratory to go beyond this limitation, especially where, as in the venereal diseases and cancer, the danger is great. It might well be said that the work of health laboratories should be limited only by the lack of money the public will provide through their governing bodies for maintenance. Usually the routine work consists in making examinations of exudates and tissue in cases of suspected tuberculosis; exudates from the nose and throat in cases suspected of carrying diphtheria both for diagnosis and release from quarantine; the preparation of materials for the Shick test to determine susceptibility of individuals to diphtheria (especially children and inmates of institutions where epidemics of this disease are apt to spread); the blood, stools, and urine from suspected cases of typhoid fever or its allies and the preparation of typhoid prophylactic; spinal fluid from suspected cases of cerebro-spinal meningitis and poliomyelitis; exudates and tissue from suspected cases of anthrax, actinomycosis, blastomycosis, leprosy, etc.; brain of man or the lower animals in suspected cases of rabies, and giving the Pasteur treatment to people who have been exposed; necessary examinations for cholera, plague, and other diseases not at present frequent in this community.

In the supervision of public water and milk supplies the laboratory-worker can be of the greatest service, since it is possible by constant supervision to illuminate the danger of conveying infection by either of these two routes. Here, too, there should be a close association between field and laboratory investigations if the greatest good is to be obtained. If safety is to be assured, frequent laboratory determinations and field investigations should be made, since at

any time accidents may happen which result in either water or milk becoming infected, and thus affording a source from which a very great number of cases of certain of these communicable diseases may arise.

The food and drug laboratory is concerned principally with the adulteration of foods and drugs. An extension of the use of such a department might be made, especially in the direction of infant-feeding, and the determinations usually undertaken in hospital laboratories in nutrition experiments. This side of the public-health laboratory has not as yet received the consideration and appreciation it deserves.

In attempts to add to the comforts of community life, problems arise which require laboratory solution, especially from an engineering point of view. Most of these problems have to do with the disposal of wastes in a sanitary way, so that they will be neither offensive to the senses nor capable of acting as a source from which communicable diseases may arise.

Enough has been said to indicate that a public-health laboratory is not a single entity, but is comprised of a number of units, all differentiated, but with points of contact between certain of the units. It should better be known as public-health laboratories. Many different problems are presented, with all of which it is impossible for one individual to be familiar. It must be appreciated, therefore, that just as in other sciences, and so in public-health laboratories, specialization has occurred to a very considerable extent.

However, no matter how great the specialization, each has functions in addition to the public service which they fulfil. These other functions are research and education, although in most organizations the greatest amount of stress is laid on the public-service function of the laboratories. These other two functions should never be lost sight of, and their importance is difficult to overestimate. Unfortunately, it usually happens that most public-health laboratories are undermanned, so that all the time and energy of the workers is absorbed in the service function, leaving the other two sadly neglected.

There are certain elements that are necessary for successful and efficient work in any of these various laboratory branches of public-health activities. As already indicated, the work is highly technical and specialized, and, as such, demands the service of well-trained, full-time workers if accuracy and reliability of results are to be assured. The idea that a recent graduate or an office-girl is, *ipso facto*, qualified to do laboratory-work in any branch is surely passing, and the importance of receiving dependable results from experienced workers is becoming appreciated and demanded. In the beginning of development the number of such workers need not be great, as it is possible to obtain men who are sufficiently qualified to oversee various branches until expansion demands an increase of the force. Adequate quarters should be specially designed and equipped with a view to carrying on the work so as to produce a maximum of results with a minimum expenditure of energy. Efficient clerical and laboratory assistants will always prove an economy. These laboratories should be so situated, geographically, that they are of easy access, so that the least possible delay will occur in making reports to physicians and health officials. Transportation facilities will have considerable bearing on the location of the laboratories, since the mails must be depended upon for delivering of specimens. Where the territory to be covered is of considerable extent and the population scattered, branch laboratories can be maintained in the larger centres of population. When emergencies demand quick action or the character of the work necessitates investigation on the spot, "travelling laboratories" may be sent out with an investigator to satisfy the immediate needs.

All of these features point to the necessity of providing an adequate budget for the proper support of the needs of the laboratories. One health department has for its motto, "Public health is a purchasable commodity." This surely means two things: First, that it can be purchased; second, and equally important, it must be bought. The private individual who attempts to obtain something for nothing, or for very much less than its face value, is usually looked upon as a grafter or a crook. Should a community expect to obtain a valuable commodity gratis or at less than a fair price? It has truly been said that "The public health is public wealth," which should indicate these two are closely interrelated. The service rendered should be free to the individual, but supported by the community (and where possible to obtain philanthropic funds) and under governmental control at least in part, so that the results obtained can be legally applied to effect reform. No successful health-laboratory work can be carried out on a fee basis for each examination, collected either from the patient or the community,

since such a practice places a natural reluctance, from a financial consideration, to taking full advantage of all the services that can be rendered in limiting an epidemic.

There are other essentials upon which the success of a public-health laboratory depends. Since public health is a group science dealing with groups of individuals by groups of workers, it is necessary that an active and hearty co-operation should occur among all concerned. In order to obtain such co-operation it is necessary for the laity and physician to understand what the objects and methods of public-health workers are. Since the science is comparatively new, there is a large amount of education necessary to this end. It must be appreciated that the funds for the support of health activities come more or less directly from the governmental bodies. It is usually only through pressure from their constituents that the individual members of such governing bodies can be made to see the necessity of adequately providing funds for the work. The education of the public is therefore necessary if satisfactory advance is to be made in public-health laboratory work, or, in fact, any other public-health activity.

The public-health laboratory is closely related to a variety of people. In the first place, it should be intimately associated with the health department of the community, since it is the latter that is clothed with the police power necessary for the application of the results obtained in the laboratory for the control of some particular community disease. It is related to the units of the population, particularly the practising physician, and each individual family, since in many cases the duration of quarantine is dependent upon laboratory findings. Where groups of people are collected together in hospitals, charitable institutions, schools, etc., the laboratory is of particular use, since in such institutions communicable diseases find a greater opportunity to spread. On account of the education that is so necessary at present, a teaching function is added to the ordinary laboratory function, and in this way the laboratory is brought into close association with the teaching institutions, such as the public or high schools and universities.

In determining the organization of a laboratory it must be recognized that it is impossible to lay down an absolute rule which can make all laboratories exactly the same. Each one has to meet the particular needs of the particular community in which it happens to be. If, however, recognition is taken of the relation of a laboratory to the health department, to the hospital, and to the university, it should be possible to develop a single institution which will adequately serve the needs of each, and so prevent the duplication of equipment and workers, which is sure to occur when each of these three different contributing parties attempt to establish laboratory-work restricted to their particular needs. Where such a co-operation exists and can be fostered, it is possible to avoid many of the petty jealousies and friction which invariably arise when different groups of workers approach each other at the border-line of their work.

Discussion on Dr. Mullin's Paper.

The Chairman: Now the discussion, and I think Dr. Wesbrook asked the privilege of opening the discussion, so I call upon him first.

Dr. Wesbrook: Mr. Chairman, Ladies and Gentlemen,—I feel as if I had been doing a great deal more than my share of the talking this morning. Dr. Mullin's paper is clear and to the point, and he has shown the various lines of service which a public-health laboratory is able to give to the people. In his modesty he failed to tell you that he has been the head of a laboratory that covers practically all these things, the State Board of Health Laboratory of Minnesota, of which he was chief; and he was a member also of the University of Kingston. This laboratory was inaugurated and was made an integral part of the University of Minnesota. It had a Pasteur Institute for the treatment of those who had been exposed to rabies. The first year of its operation it treated 212 people. I think it was the 242nd case in which fatal results occurred, and I think that they have had none since. They must have treated from 1,200 to 1,500 people by this time. That is not an important matter in British Columbia yet, but we never know when it will be.

As bearing upon what the Provincial Secretary and Minister of Education said a few minutes ago, that it is the spectacular cases which appeal to the public; that is, speaking of scarlet fever and of tuberculosis, the stimulus that is given to public activity and, if necessary, public expense when a thing like scarlet fever appears. I can say the same thing about cholera. I was in Germany one time engaged in research-work at Marburg under Karl Bruncker, when they had a case of cholera in a little community about three or four miles outside of this town. The

manœuvres of the troops for that year were to be held about three weeks later, and 12,000 troops were to be assembled there. I remember what I felt like at night when I discovered—we were notified at about 11 o'clock that we had cholera in the community. I think I was the only English-speaking person left in that community by noon the next day. It was part of my duty, because I had already worked for three years on cholera, and I acted as a volunteer assistant, and three of us carried out all the necessary measures for the prevention of the disease. We only had sixteen cases and four deaths, so I think we did very well. We had sixteen pure cultures from these sixteen patients, though, in a very few hours, so that we can see what the stimulus of cholera did—in 1894 this was. In 1892 Hamburg had its particular lesson.

Now, to give you an experience from rabies: We got $5,000 to run that institution for the first year. It was part of the public-health laboratories there. We were able to treat 212 cases. Everybody was afraid of rabies. The doctors and the people knew so little about it that we could have got any amount of money we wanted for that, but we couldn't get it for water; we couldn't get it for tuberculosis; we couldn't get it for measles and all those other diseases, although the deaths from measles at that time were greater than the deaths from smallpox, although smallpox was quite prevalent, but it was of the very mild type. The people apparently, many of them, would rather have smallpox than be vaccinated; but they had to change their mind shortly afterwards, as it was said yesterday.

Now, there were other features of the work; they had engineers, chemists, bacteriologists, and a new trained specialist and epidemiologist. The work was here before, but the name was born just recently. We were speaking of field laboratories; we wouldn't examine specimens of water sent up by an analyst, somebody who didn't know whether the water was to blame or not. If there were a question of that kind came up, in the public interest we would send a travelling-laboratory man, and a travelling specialist sometimes, and sometimes a chemist and a bacteriologist, and the engineer. Well, I won't go into this thing further, except to extend a little what Dr. Mullin was saying and give you the idea that he had this in charge. I will say this, and I think this is a public lesson we get out of it: It is particularly hard for us in the pioneering stages of our different communities, owing to the fact that this is a huge Province and the population is relatively small, and we are as yet scientifically in the pioneering stage; but we do not deny ourselves automobiles, and I think we shall have air-ships pretty soon. We have the best hotel in Canada, supposedly, in this town—the most expensive one, anyway. We haven't denied ourselves these things in our pioneer days; now, why shouldn't we have the things that are most essential, because in public health and public wealth, as Dr. Mullin has said, we would be conserving our cheapest asset. Now, in order to conserve this, there are a lot of people required for which our social and economic conditions as yet make no provision. A consulting engineer (several of them for competition) in waterworks in this Province—I mean the sanitary engineer—would starve to death if it were left for individuals to employ him. A chemist devoting himself in some way to a line of public-health work would be equally called upon to live at his own expense. The medical profession cannot—their patients are not yet trained to believe in it to a sufficient extent—the laboratory-man in medicine cannot make a living, so that from a number of public bodies it becomes necessary to define certain groups of people. Amongst them every city ought to have, as Victor Bond, of the University of Michigan, says, a forensic institute; you should have a medical man; you should have chemists; we should have physiological chemists; we should have other experts, and particularly so that when an autopsy is held, if it is held by a man who is trained to do that work, just the same as we go to a trained surgeon; we should have them—there is one group of the forensic institute. I won't go into it further, but I think I have made my question plain. Then you have a group of public-health experts, of which Dr. Mullin has told us; then we have the group of diagnostic experts, not for the purpose of preventing disease, but for the purpose of suggesting a cure. Nowadays you can make sections of the tumours, and these are examined whilst the surgeon is working. You need blood-clots; you need analyses of stomach contents; you need people to study the metabolism of a particular patient to see on what dietetic treatment he shall be put, or to see what is wrong inside—see why he is not working right. You need all those, and we need sanitary engineers, as I have said. Now, how are we going to get them; how are we going to provide for them? The Provincial Government needs public-health laboratory facilities; Vancouver needs public-health laboratory facilities; and in some places they separate the water branch from the public health, but it need not be done. It just depends on who is going to be

boss of the job, whether it is the sanitation, whether it is to be sanitation from an engineering point of view or engineering from a public-health point of view. There are no difficulties in it. As Dr. Mullin said a little while ago, you are not going to have two organizations that are exactly alike. Personnel, after all, is what counts rather than system.

Now, we can't get all of these things at once here; but the Vancouver Hospital is short of funds—and, by the way, the Vancouver Hospital Laboratory should not be run on the basis of fees to be collected at the time. (Applause.) It should not rest on that basis. Suppose a patient in the hospital, when he is ill, you make an examination of him; if you charge him for that examination you are practically precluded from making a whole lot of other examinations afterwards. He may prove to be a very difficult case, and he may prove to be a very instructive and educational case; and suppose you want to examine him every fifteen minutes day after day, you can't charge him or some one else for each one of these examinations. I am getting off the track; that is just an aside. But ultimately a group of men should be brought together, consisting of bateriologists, chemists, physiologists, pathologists, engineers, and various other people, for the carrying-on of the public service. Now, if that cannot be paid out of the fees from patients, if it cannot be paid by municipalities employing experts when they need them—here is another aside—you know they usually get into all sorts of difficulties because it costs from $5,000 to $10,000 to have experts, and after they get into difficulties they spend $100,000 in getting out; and they do that under the stress of an epidemic of typhoid fever or cholera, or something of the kind. But these have to be provided. Now, you can get them one at a time until you have got your group. You can get them, for instance, in this Province by the Provincial Government, the Provincial University, the Municipality of Vancouver, and various other municipalities, all co-operating. You see, it is public money after all, and I do not believe, personally, that you ought to gather certain problems together and leave other problems absolutely untouched, because as soon as you get a little bunch of people together they all get interested in the same problem, they all tackle it, and they leave everything else undone.

The function of a university is to teach a course, to teach what is known now. It is just as much its function to add to that knowledge, because all knowledge would stop if everybody confined himself to teaching; in fact, that is the most important thing. It should be done within the university; it should be done without the university; it should be done in co-operation with every existing official organization in the Province. It is the people's money which is being spent and we should give the largest return to the people. In addition, it should have experts, and it must have experts, for if the Province is not going to get the best experts in its university it had better keep out of the business altogether. Those experts ought to be available also for the purpose of giving advice and suggestions, undertaking investigations and researches, the result of which could be available for the different departments of Government. It seems to me that that should be apparent to everybody.

Now, I want to make one thing quite clear: The university has nothing to do with administration or legislation or politics, and the moment it oversteps that—the best State university in the United States, the University of Wisconsin, made that fatal mistake once. It was called upon to investigate the health of the city in every way, and it did make a magnificent job. Now, what happens? After you have made a diagnosis and a prognosis and suggested treatment, it is very easy to hold the patient's nose and make him swallow a pill. Now, that is a Government job; it is not the university's job, and the university only gets into trouble whenever it begins to connect principles and men, to connect men with principles. It must keep away from that. Now, I think we can make this start; I think we have got a start with this big movement. We have only one here now; that man is Dr. Mullin, and he has indicated to you that public health has four specialties. He has his own special duties and desires. Now, if we can get that group started, it seems to me that a Provincial university is the logical basis for the beginning of that; ultimately we will have a group which will not only take care of the work, but it will train other workers in that line.

Now, we have been getting impatient in the university at the present time to start a medical school, but we have all seen that in public health we need special training. Vancouver is an important town; there is no public-health laboratory nearer than Toronto or McGill, and as far as I know these are the only ones existing in Canada. We can only start that and, when the time comes, a medical school, and the private practice should be practically related to that, this question of public health, and we could have here built up in this community a medical

school out of the bigger foundation of a public-health organization. That lies in the future, how far we do not know; but we ought to provide for immediate needs as best we can, and we ought to conserve our money so that every public body contributes its quota and co-operates instead of competes. That seems to me to be the practical outcome of this paper this morning, so far as we can directly apply it.

I know that Dr. Young is quite in sympathy with such ideas. I know that the Hon. Provincial Secretary, Dr. MacLean, is in sympathy with such ideas. I know that Dr. Young has the matter in hand with the authorities of the Vancouver General Hospital here; but one man, and he has to be very very efficient in the one line, cannot spread himself over all of these things for long and give satisfaction to himself and to the community. I believe that that is one of the things in which we might co-operate, and in which perhaps the university might be the focusing-point. The same kind of thing is being undertaken, I might say, although this does not bear on the subject, in a number of other lines. In agriculture, for instance, at the present time there is close co-operation between the Provincial Department, the Dominion Department, and the University; and we hope that that will be true of forestry and of mines and of fisheries, and that will make us really of some practical, as well as potentially practical, value to the community which has supported, and had the courage to support, a Provincial university during war-time. When we are getting impatient it is most comforting to know that the people of this Province had the courage, anyway, to start a university during war-time; and it seems to me that by this time it should be started, because it is the day of the expert, anyway, chronologically, and the war has made it doubly of the expert, and we cannot get along very much longer without training and using the expert in this Province more than we have, but we will so use it in industry, in social and other life, the way we have been using its products for pleasure and for comfort.

Now, I apologize for having wandered from the subject, Mr. Chairman. It is always a pleasure to speak to people who are interested in the same subject which has interested me for so long; and I always find that whenever I speak of the university here, people are so interested and so kind that I am inclined to transgress, and I hope that I shall be forgiven; and I can assure you that every member of the staff and those on the executive and governing body of the university are almost anxious to be of the utmost possible service to the Province as a whole, and to do their share in national and Imperial problems which we are now facing. (Applause.)

The Chairman: We shall be glad to have discussion by any one else on the subject. I think we have always got some light from this kind of paper. I say some light, but I should say a great deal of light, a great deal of instruction. Speaking for myself, I certainly have; I can see great possibilities opening up as the result. Any further discussion? We will be glad to hear from any one.

Dr. Hepworth: Mr. Chairman, Ladies and Gentlemen: I might say a few words from the standpoint of the general practitioner. This laboratory diagnosis is a thing that we cannot get along without, but I think the subject has been pretty well taken up. The question is, if you want to make a laboratory diagnosis, who is going to pay? Is it the municipality or is it the doctors? I have had so many cases where I have had to foot my own bill to make the diagnosis, where the people themselves cannot afford to pay; that is the trouble. That is one point that I found out about that. Many a time I have had certain cases where I wanted to do it and have had to pay $3 or $2. Lots of patients cannot afford to pay for that. When I send a patient to the Vancouver General Hospital I have to pay this $2. Well, if he pays me $2 he thinks he has paid me plenty, and all I can ever get out of him is about $3. It may cost me actually a lot more, and the question is, is there any method of getting the municipality to foot some of these bills? As far as laboratory diagnosis goes, why there is no question of the necessity of having one. Last year I wanted to get a Babcock milk-tester, and I went to Dr. Underhill to get some information from him about it; but I couldn't get any one to put up the $10 for it. I had no power to force them to give me a Babcock milk-tester. What is the good of Health Officers if you cannot get anything done. It is all very fine to have all this theory and all this talk and paper, but we want practice; we want the stuff while we are working; that is when we want it. I tell you it is right at home we need it; and when you cannot get anything done, what are you going to do? They haven't spent a 5-cent piece on sanitary measures in my town this summer, and I had no

power to spend any money. As to this laboratory diagnosis, I had four or five cases that required laboratory diagnosis and they haven't any money to pay for it. The Council have no power to do it; so, if they are going to do anything, we want it for practice; we don't want it in theory; we want to get it done. I think the municipality in certain cases would pay some, possibly the Province would pay some, but here I have had all kinds of cases that required laboratory diagnosis and I cannot get it done; and I think Dr. Wesbrook took the proper point on that, that you cannot get the people to put up anything; you cannot get your municipality to do anything; but I think that some time the Province will begin to see that they should do these things.

The Chairman: Any discussion on this paper? If there is no further discussion I will ask Dr. Mullin to reply.

Dr. Mullin: I don't think I have anything to say.

The Chairman: Nothing further; then that completes the programme for this morning. We will meet at half-past two and continue the work of the Convention. As you know, there is just as good work before us as we have had previously, so if you meet promptly at half-past 2 the Convention will resume.

The Convention thereupon took a recess until 2.30 p.m.

Afternoon Session.

The Convention resumed at 2.30 p.m. pursuant to adjournment.

The Chairman: Well, ladies and gentlemen, we will call this meeting to order and have the last session. The first paper is "Milk in Relation to Public Health," by Dr. A. G. Price, Medical Health Officer of Victoria. I call on Dr. Price for his paper. (Applause.)

MILK IN RELATION TO PUBLIC HEALTH.

By A. G. Price, M.B., B.Ch., Medical Health Officer, Victoria, B.C.

The use of cow's milk as a food, especially for the nourishment of infants, and the fact that the composition of milk furnishes so excellent a culture medium for bacteria, and is so fitted for the conveyance of germs of infectious diseases, places milk in the forefront among matters of hygiene which must be considered and studied by Health Officers with a view to the maintenance of public health.

In considering the milk-supply to cities and towns or rural districts, it is necessary to consider the milk in three stages—namely, milk with the producer, milk with the retailer, and milk with the consumer. In other words, milk in the farm, milk in the dairy, and milk in the home.

Let us first consider milk in the farm. Ideal milk within the udder of the healthy cow should be sterile. It is found, however, that the milk-ducts and teats of a perfectly healthy cow always contain bacteria. No doubt these come there through infection of residual milk by bacteria from the exterior of the udder.

The anatomical location of the udder pre-eminently lends itself to the collection of micro-organisms from the cow's hoofs, from the skin, and from the ground on which the cow lies. Flies lighting on the teats, and the hands of the milker too, are means of contamination by micro-organisms. It is therefore impossible to collect milk free from bacteria; even collected under the very best circumstances, fresh milk is computed to contain about 500 micro-organisms per c.c., while the average number of micro-organisms in milk collected in the ordinary way and as sold to the public has been estimated at not less than 400,000 per c.c. Although it is practically impossible to procure an absolutely sterile milk from the cow, yet it should be the aim of every producer to collect milk from his cows under the most favourable conditions for procuring the purest milk possible.

It is with this object in view that legislation is made for the guidance and education of producers endeavouring to produce pure milk, and for the punishment of those who neglect precautions against contamination. The latest amended "Contagious Diseases (Animals) Act" of this Province is one which eminently strives for procuring of milk under the best conditions.

stress being laid upon sanitary conditions of stables, the care and health of the cows, the cleanliness of the dairies and utensils, and the health and cleanliness of the milkers; the premises, stables, and cows being classified into three grades A, B, and C. Mark you, it is not the milk which is classified, but the premises and cows, with the assumption, and rightly so, that the better and cleaner the premises and cows, the better and purer the milk. Stress is laid upon the freedom of cows from disease, especially from tuberculosis. No milk is permitted to be sold from diseased cows, and such cows must be slaughtered.

The subject of cattle-diseases directly communicable from the cow to man through milk is one which can only be briefly touched upon now. It is one which, if at all adequately treated, would occupy more time than is alloted to the reading of this paper. Foot-and-mouth disease, scarlet fever, vaccinia, and tuberculosis are among the diseases which affect cattle and which are communicable to man either in the same or in a modified form.

The question of the conveyance of tuberculosis to man from the cow by means of milk is one of the greatest importance and one which has been extensively investigated by bacteriologists. Owing to the morphological and pathogenic difference between the bacillus of bovine tuberculosis in the cow and bacillus of tuberculosis in the lungs of man, discussions and differences of opinion arose as to the identity of the two types. The bovine type is shorter than that found in man and it grows less actively in artificial media. The difference in pathogenic qualities of the bacilli on certain animals is marked. Bovine bacilli injected into a rabbit was found to kill the rabbit in a few weeks, while the human type of bacilli injected caused but mild disease and did not kill the rabbit for six months, and occasionally failed to kill the rabbit at all. Attempts made to infect cattle with the human type of bacilli for the most part have failed; while infections of human beings with the bovine type have been proved beyond doubt. Koch, realizing these morphological and pathogenic differences, attributed such differences to the environment and nature of the infected subject rather than to the infecting agent.

I quote the following conclusions of the Royal Commission on Tuberculosis given in their report: "There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis, and there also can be no doubt that in the majority at least of these cases the bacillus is introduced through cow's milk."

The following facts are conceded: Bovine tuberculosis is communicable to man; bovine tuberculosis affects especially young children, causing abdominal tuberculosis; pulmonary tuberculosis in adults is often traceable to abdominal bovine tuberculosis in childhood.

Keeping the above facts in view, it is plain to see of what great importance as a factor in the suppression of human tuberculosis is the prevention of the consumption of milk from cows affected with tuberculosis.

The "Contagious Diseases (Animals) Act" demands the periodic examination of all cows for tuberculosis and forbids the sale of milk from affected cows: and thus, together with sanitary rules and regulations applicable to stables, legislates for the production of milk in as pure and wholesome condition as possible.

So far we have considered the milk as secreted and extracted from the cow with a view to maintaining its purity at the source. Let us now consider the milk from the time it leaves the stable till it reaches the consumer. The protection of milk from contamination and its preservation during this period, whether it be long or short, is of equal importance from a hygienic aspect as the production of milk under sanitary conditions in the stable.

The rapidity with which micro-organisms increase in milk is very great under favourable temperatures. Kept at freezing-point the bacterial increase is not appreciable, but kept at a temperature 86° Fahr. for twenty-four hours it was found that a sample of milk at first containing 30,000 micro-organisms per c.c. at the end of this time gave a count of 14,000,000,000 of bacteria per c.c. It is evident, therefore, that in order to prevent the increase of bacteria in milk, the milk should be cooled as soon as possible after collecting and kept at a temperature near the freezing-point.

Furthermore, in order to prevent the increase of bacteria, additional micro-organisms must be kept from entering the milk from the atmosphere, from dirty utensils, and from water used in washing same. Milk, therefore, after cooling should be placed in covered containers which have been efficiently washed and sterilized by means of steam or boiling water. It is best to place milk in glass bottles immediately after cooling. Keeping of milk in metal cans longer than

is absolutely necessary is inadvisable, nor under any circumstances should milk be placed warm in a can in which it is to remain for any length of time. Milk is a fluid which readily absorbs a metallic taste from the can in which it is contained, and especially so if the milk is warm.

Strict regulations are laid down by the "Contagious Diseases (Animals) Act" as to the construction, the cleansing, and the keeping clean of dairies and utensils where milk is kept for the guidance of the dairymen and the safeguarding of the health of the public. It is necessary that Health Officers should inspect dairies and inspect them frequently and efficiently. Many dairymen are uneducated as to what aseptic cleanliness means, and they do not realize the necessity of such cleanliness; they are apt to show gross ignorance or carelessness in matters of milk hygiene unless continually reminded or instructed, or even threatened with punishment for neglect.

Let us now consider the milk in the home. The consumer may have procured milk from healthy cows under best conditions of stable and dairy, from a producer or vendor who fully conforms to milk regulations under frequent inspection of Health Officers; yet illness from milk-born germs, diphtheria, typhoid fever, scarlet fever, or diarrhœa may occur in the home. The illness is reported, the suffering family places the blame on the milk-vendor, the dairy or farm from which the milk has come. The dairy is visited, a sample of milk taken and examined and found to be good; then the cause of illness is put down as "undetermined."

When diphtheria, typhoid, or diarrhœa occurs in a household, I make it my first duty to examine the larder or place where the food and milk are kept before making inquiries as to whence the milk has been procured or examining the dairy or store. In 90 per cent. of cases I find that the milk is kept in a place or in such a manner as to invite contamination and growth of germs.

It is well known that the diphtheria bacilli, the bacilli of typhoid, and the various micro-organisms which are the cause of infantile diarrhœa grow freely in milk; they are not indigenous to milk, but they are implanted in the milk from outside sources. Every precaution may be taken by Acts and regulations, by inspections of stables, and supervision of dairies to prevent contamination of milk, but all to no avail if the milk in the home is exposed to the access of germs of disease.

Some years ago, while engaged in practice in Ireland in a town which at that time had no system of sewers other than cesspits, an epidemic of diphtheria occurred. In one house where four children had diphtheria the milk was kept in an open pan on a window-sill in close proximity to a dirty toilet to which flies had free access. In another house where there were three cases of diphtheria a broken drain ran under the floor of the larder where the milk was kept, the drain leading direct to the cess-pit. In another house nine children visitors were affected with diphtheria; all the children had partaken of milk from the same stock; on investigation it was found that a cesspit had been recently emptied in close proximity to the milk-house in which the milk had been exposed and beside which the cow had been milked. From past experience I have come to the conclusion that diphtheria is produced by infected milk more than by any other cause. Some time ago I had occasion to examine a dirty mixture of milk and water taken from pools on the concrete floor of a room where milk was kept; microscopical examination revealed bacteria identical in appearance with diphtheria bacilli.

The germs of typhoid fever are supposed to be more frequently carried by water than by other means, but is it not possible or probable that in the majority of sporadic cases of typhoid the germs of the disease may have been carried by the house-fly or by other means to milk and have thus been transmitted to the patient?

I recollect some years ago, in a neighbouring town to where I lived, a sudden epidemic of typhoid occurred; there were some fifty cases, all of which were traced to infection from one case occurring at an unsanitary dairy which supplied milk to the families affected. We know that the typhoid bacillus grows rapidly in milk, and it therefore behoves Health Officers to be extra careful in the supervision of milk-supply with a view to prevention of contamination when cases of typhoid fever exist in their district.

The proper care of milk in the home is only to be accomplished through education of the public. Many householders are ready to place the blame for illness occurring in the families upon outside, supposed, insanitary conditions, while they overlook their own negligence and carelessness, or in many cases ignorance.

The study of hygiene, and especially the subject of the transmission of diseases, should be taught in all public schools of the Province, and simply worded bulletins on the subject should be distributed. It is beyond the powers of Health Officers to personally attend to milk in the homes in a city. The Health Officer can only supervise the milk in the farms and in the dairies; further his influence cannot go to prevent milk-contamination except through education. The importance of the supply of purest milk, not only to the homes but to the mouths and stomachs of children, is a matter which cannot be overrated.

Up to a few years ago the principal cause of deaths among infants in cities of Eastern Canada was summer diarrhœa, second to which was immaturity and still-births (a matter needing investigation, but one outside the scope of this paper). The death-rate of children in Eastern cities is considerably higher during the months of July, August, and September than other months, whilst the death-rate of adults is highest during winter months. Statistics show that in these cities the child deaths in summer were due principally to diarrhœa, and that since, during the last few years, more rigid milk regulations have been made and enforced with the object of supplying pure milk to children, the infant death-rate from diarrhœa has fallen, and we now find that prenatal causes, premature and still-births are the leading causes of infant mortality.

There is still vast room for improvement. Diarrhœa should be one of the least frequent causes of infant deaths in these cities. In the City of Vancouver in the year 1916 the deaths from infantile diarrhœa numbered only seven, while in Victoria City there was only one death from this cause, or about one per thousand births. While in a more eastern city in 1912 seventy-nine deaths of infants from digestive trouble per thousand births occurred, and in 1915 in the same city twenty-eight infants per thousand births died from the same cause. These records show a satisfactory condition of milk-supplies in Vancouver and Victoria, if we judge the purity of the milk-supply according to the absence of diarrhœa.

In New York the National Commission on Milk Standards, which met in February of this year, laid particular stress upon the grading of milk by bacterial counts, advocating that the control of milk-supply for the community should be based primarily on this system.

The Commission stated that the fundamental objects of grading milk are:—

(*a.*) To aid in making safe for human consumption all milk which can be legally sold for drinking purposes:

(*b.*) To distinguish between classes of milk which, while all are safe, are of different degrees of excellence in respect to cleanliness:

(*c.*) To provide means by which the consumer can make intelligent selection of the kind of milk he wishes to purchase:

(*d.*) To encourage demand for clean milk, thereby rewarding efforts of clean-milk producers.

The Commission proposed that milk be graded into A, B, and C classes. A grade milk must contain less than 10,000 bacteria per c.c.; B grade, less than 1,000,000 bacteria per c.c.; C grade, any number over 1,000,000 bacteria per c.c. A and B grades to be used for food raw, while C grade be used for food only after cooking.

The Commission further stated that in establishing the bacterial standards for a city it is important to take into consideration the necessary age of the milk, the distance it is hauled, and the methods employed in hauling, in addition to the sanitary condition of the milk at its source. This latter finding of the Commission appears to me to be an acknowledgment of the faultiness of the bacterial-count standard previously advocated.

If the bacterial standard were a system to be relied upon for the supply of pure milk, it would be unnecessary to consider the sources of milk-supply. On the other hand, if the source of the milk-supply be sanitary and the storing and hauling be under best conditions, then the bacterial-count standard is unnecessary.

It appears to me that bacterial count is useful in proving the age or impurity of milk, but that it is too lengthy a proceeding and too impracticable in making frequent and quick examinations to be satisfactory for regulating the milk-supply of cities. It takes several days to make cultures for bacterial count. A sample of milk taken from a dairy one day, and another sample taken from the same dairy another day, may vary considerably in bacterial counts. It would be impossible, owing to the time required, to grade milk every day by bacterial-count standard, and there would be no guarantee that a dairy which supplied grade A milk a week ago was supplying the same grade to-day.

For the guaranteeing the purest milk-supply, it appears to me that the best method of procedure is that which is followed in this Province—namely, strict attention to the cleanliness of the source, the keeping and delivery of milk, and to the cleanliness and health of the cattle and milkers. Bacterial counts are unnecessary.

In England, Scotland, and Ireland the "Contagious Diseases (Animals) Acts" are very similar to that of this Province. They order the registration of cow-keepers and dairymen, the inspection of cattle, cow-sheds, and dairies, and direct sanitation of same and cleanliness of milk-stores and utensils, but they do not consider bacterial count.

Thus far we have treated the subject of raw milk and bacteria and have considered the methods best adapted for the procuring a raw milk in as pure a condition as possible. We have seen that, in spite of all precautions taken, raw milk still contains bacteria. These bacteria, however, are not of pathogenic type, they are bacteria which cause acidification, curdling, and decomposition. We have seen that under suitable temperatures the process of decomposition is rapid. We must therefore consider the methods of preservation of milk. There are three methods—that dependent on low temperature, which inhibits the growth of bacteria; that dependent on high temperature, which kills the bacteria; and that which depends on the addition of antiseptics to the milk. Germs will not grow in milk held at freezing temperature; for this reason all milk in dairies and the homes should be kept at a temperature as near freezing as possible. This is not feasible in the homes of the poor, who have not refrigerators; we therefore must advocate for them pasteurization of milk. Pasteurization of milk is simply the heating of milk to a temperature of 150° Fahr. for half an hour and then rapidly cooling. This process kills pathogenic germs without appreciably affecting the nutritive qualities of the milk. Consumers of milk, especially mothers of children, should learn the methods of pasteurizing milk and carry them out in their own homes. The purchasing of pasteurized milk from dairies is not satisfactory unless the dairies are specially licensed and supervised daily.

To completely sterilize milk it is necessary to raise the temperature to boiling-point and to repeat the boiling on several successive days. The process of boiling, though rendering milk absolutely safe, has its drawbacks; it alters the taste, destroys the fine emulsification of fat, coagulates the lactalbumin, and renders casein less easy of digestion.

The lower temperature in pasteurization does not appreciably affect the digestibility or nutrient properties of milk. Preservation of milk by the addition of antiseptics, such as salicylic acid, boric acid, formalin, or peroxide of hydrogen, should be prohibited both in the dairy and in the home as an injurious adulteration.

The nutrient value or richness of milk is usually determined by an estimation of the percentage of butter-fat and solids not fat. Boards of Health in most municipalities demand that all milk sold shall contain 3.25 per cent. butter-fat and 8.5 per cent. solids not fat. In setting such a standard of richness it appears that no account is taken of the breed of cattle supplying the milk. The milk of the Holstein cow will seldom give 3 per cent. butter-fat, while the Jersey cow usually gives as much as 5 per cent. Keepers of Holstein cows as a rule keep Jersey cows and mix the Jersey milk with the Holstein milk in order to make up the deficiency of butter-fat in the latter. This is a wrong policy, especially where the feeding of infants is concerned. The milk of the Holstein cow with its smaller fat-globules is more digestible with infants than Jersey milk, while the mixture of the two milks is found to be less digestible than Jersey milk alone. Far better would it be if the standard of butter-fat were designated to each breed of cow and permission granted to sell Holstein milk as Holstein milk although it contains only 3 or even 2.75 per cent. butter-fat. Holstein milk, though lacking in butter-fat, contains the necessary casein and solids and is more suitable for infants.

Samples of milk from various dairies and milk-vendors in a city should be frequently tested for butter-fat and for solids not fat; a deficiency in the quantity of solids indicates the addition of water, while the quality of solids will show whether foreign substance has been added; there is no fraudulent adulteration of milk which cannot be discovered by careful examination.

If central milk-distributing stations were instituted in all cities, all milk-vendors bringing their milk daily to one of these stations where the milk would be checked and samples taken for examination, such a scheme would go a long way towards a satisfactory settlement of the pure-milk question; it would prevent adulteration and would be the means of bringing the best milk to the consumer; it would make the work of the Health Officer easier of accomplishment, but would probably raise the price of milk to the consumer.

In the City of Victoria by-laws will shortly be in operation which will demand inspections, grading, and registration of all dairies and farms supplying milk and the licensing of all milk-vendors selling milk in the City; but no steps have yet been taken towards the institution of central milk-distributing stations.

In conclusion, I may say that milk is the first, the most perfect, and perhaps the most universally used of all foods, and yet the most dangerous. It therefore behoves all Health Officers to untiringly endeavour to procure and maintain the purest possible milk-supply in their respective cities, municipalities, or rural districts by frequent inspection of all farms and dairies supplying milk, by education of farmers and dairymen along sanitary lines, not withholding prosecutions where there is persistent neglect of sanitary precautions.

And, lastly, by education of the public, the consumers of milk, as to how to keep milk to the best advantage in the interests of their own health and in the interest of the preservation of child-life.

(At this stage Dr. Wrinch took the chair.)

DISCUSSION ON DR. PRICE'S PAPER.

The Chairman: The paper will now be open for discussion by any one present. I would ask that in the interests of all who are in the hall, and especially on account of the disturbing noises of the street outside, which are inevitable, you will come forward to the front and then you can more readily face those that are here and be heard by them in the discussion. The discussion is to be opened by Dr. Proctor, also by Mr. McDonald, Live Stock Commissioner.

Dr. Proctor: Mr. Chairman, Ladies and Gentlemen,—I did not know that I was to be the first to discuss this excellent paper which we have just listened to; but we have had a very fine résumé of the whole subject, from the dairy to the consumer, and dealing with the question of bovine tuberculosis. It is now known that bovine tuberculosis is not the proper name at all; it is definitely transmittable to man, and the Government of this Province deserve all sorts of credit for the powerful and efficient way in which they have insisted on the examination. It means the outlay of a great deal of money for the systematic testing of our cattle for tuberculosis, but as a result to-day I think there is very little milk reaching our people from non-tuberculin-tested cattle. It would be interesting for us to know just how much bovine tuberculosis is existing among our children; but I am satisfied, if this work is continued, as I think it will be, that that will be very much eliminated, as it has been eliminated already.

I had the privilege some year ago of being on a Milk Commission in this Province. I had the privilege of working with Dr. Paton, and I hope that we accomplished some good for the Province, but we certainly learned a great deal ourselves—I learned a great deal myself. We found that the problem of the milk-supply of our people was not as simple as it appeared. It is somewhat in the nature of a chain from the dairy right to the consumer, and there are several important elements in that chain. First of all, there is the system in this Province under which these dairies are grouped and the cleanliness of the supply safeguarded. We found in the Province in those days dairies of different types. Some dairies were a credit to the Province, some were not; and we usually found that where they were not it was the result of absolute ignorance on the part of the dairymen as to what was necessary to ensure a good milk-supply. They were all willing enough to do it if they only knew how, but they didn't seem to have any conception of the danger from the fly and from having the manure-heap close to the dairy. At any rate, they seemed to be quite glad to do it when they were told; but there were certain dairies, as I said, that were—and I am sure they are different since—very much in want of cleaning out.

Then the question of transportation of that milk—that is, of our milk-supply in this city; I am not sure that it is true of Victoria or any other city—has not grown right into the facilities of the city, and the transportation is a simple matter; but in this city, at any rate, it comes from a long distance. I dare say you know that a very large proportion of your milk-supply comes from south of the boundary, from Washington; and I know one of the grievances of the dairymen in this Province was, in the line of milk-supply here, that while the dairymen in this Province were subject to all sorts of inspection which it was hard for them to live up to, hard to live up to all the rules and regulations, we had no right to go into the State of Washington and inspect their dairies and penalize them if they were not up to the scratch. That was a grievance.

It is a comparatively simple matter, of course, in the winter-time to keep milk that has been properly cooled at the proper temperature; but it is a very different thing in the hot months of the summer. I dare say many of you have been up here in Chilliwack on the main line of the Canadian Pacific Railway and the railways to the south of us, and you have seen milk-cans on the platform which have stood out after being cooled; perhaps there is something the matter with the time-card, the train has been late, and that can is standing out in the sunshine and getting thoroughly well heated, and then jogged along, and there is no attempt made at cooling until it reaches the city. These I tell you are some of the difficulties we found out when I was on that Commission. Then the milk reaches the city. One of our recommendations—I am glad to see it is one of Dr. Price's, because it is one I am thoroughly in favour of in regard to having an efficient milk-supply—is that this city and every city ought to have a central milk depot. Now, under our present system, inspectors of milk, and that statement is true to-day, get samples from the different dairymen. I believe that every man who sells milk in the city should be forced to bring his milk to a central depot, and there the City Inspector should be for the purpose of examining that milk to keep that milk up to standard, or have it thrown out in the gutter; and a few examples of that character would very soon, I think, convince these people that it does not pay to bring the milk in in an impure state. I believe, further, that, having arrived at the central depot and having had the seal of the city or the Province placed on that milk, the distribution of that milk in the city should be undertaken by the city. I dare say some of you know that discussion has been going on for some time on the price of milk. You have heard about that. A good deal of the blame for the increased cost of milk was laid at the door of everybody having to keep up a staff to distribute their own milk. Well, ladies and gentlemen, there is one thing more than another that the Germans have taught us, and that is on the subject of organization. What we want in this question of our milk-supply is better organization to reduce the cost to the consumer.

And then Dr. Price has brought very well before you what happens to the milk when it goes into the home. It is not much use having the dairyman all right, having the transportation company put ice in its cars and keep them clean and free from anything that might contaminate, without permitting them to stand out on platforms, and then reaching the central depot with every proper precaution, and the milk leaving there absolutely right and guaranteed, if you are going to have filthy conditions in the homes of the people, such as just described to you by Dr. Price in a home of that kind. That, ladies and gentlemen, is the result of uncleanliness on the part of these mothers who are feeding that milk to their children. They simply do not know. It seems to me it would be a very fine thing if every girl in our schools, rather than being taught the number of bones they have in their body, which is not particularly important or necessary for them to be taught, they should be taught something about the proper care of milk and the dangers of it; and I am sure that could be done, because it is the result of ignorance, and no mother who loves her child would possibly feed milk to it that came, as Dr. Price said, from milk in a pan 6 inches from the toilet. That is incomprehensible; they absolutely do not know. That, I think, is what we want. I think if we educate our people, our dairymen, to the great importance of taking care of this milk when they buy it, then I think that the magnificent result in the infant mortality would be greater even than it is now.

One thing before I sit down. I am a very firm believer in pasteurized milk. You know the price of pasteurized milk was put up to us by the committee. This pasteurizing of milk creates a sort of feeling with the dairymen all along the line that it does not make any difference how dirty it is; if it is pasteurized it will be all right, anyway. Well, even under the most perfect conditions you cannot be quite sure. Pasteurizing is an easy thing to do and it does not alter the chemical contents of the milk, and I believe very strongly in it. Indeed, if there is a lack of protection in other directions, it makes doubly sure.

While I am speaking of pasteurization, I might say this: that we found they had two methods, one they called the flash method, and another method which is no good at all. It should be done, and can only be done to be efficient, by the Holbein method. That is the only efficient method of pasteurizing. That is the method described by Dr. Price.

The Chairman: Mr. McDonald.

Mr. McDonald: Mr. Chairman, Ladies and Gentlemen,—I am very glad of the opportunity of being here to take part in this discussion on our milk-supply. I had the pleasure of being present at a previous meeting where we talked a good deal about tuberculosis. As has been

mentioned by Dr. Price, we have now an amendment to the "Contagious Diseases (Animals) Act"; that is, an amendment of that part of the Act relating to our dairies and milk-supply. I have brought a number of copies with me, I think I have just twenty; but I should like to have you take a copy, and any of you who want a copy, if we are short of them, I will be glad to send one to you.

Now, since the last meeting of Medical Health Officers a good deal of progress has been made in regard to the testing of cattle for tuberculosis and the control of that disease. We have not, however, made the progress that I had hoped we would be able to make owing to lack of money, and also lack of a sufficiently large staff. It has been difficult at times; I am trying to convince the powers that be that we need more money than we are getting. The year previous to this one I wanted to get $50,000 for the work, and succeeded in getting $10,000, after a desperately hard fight put up by the dairymen themselves. Dr. Proctor paid a compliment to the Government on the work that had been accomplished; I also wish to compliment the dairymen for the stand they have taken in regard to this work. Now, we have heard from different individuals some opposition to the test, and we have seen a number of letters in the press. That position, however, does not represent by any means the general opinion of our dairy-farmers. And, after all, the progress that has been made is due to a large extent to the manner in which they have gotten behind the work and supported it.

I just wish to state that in recent conventions of the British Columbia dairymen they have passed strong resolutions endorsing the work, without a single dissenting vote. In spite of the fact that, with these people assisting us, we haven't been able to prosecute the work as vigorously as we should have liked, about three years ago we were finding—less than three years ago—two years ago we were finding in the vicinity of Vancouver, in a considerable area of the district supplying the milk, 15 per cent. of reactors. At the present time we are finding 4 per cent. in these same herds, and, better still, the great majority of these cases are in the incipient stage, showing that the fact that we had got that 4 per cent. is largely due to the fact that we did not prosecute the work as vigorously as we should have done; that is, we have not followed it up as rapidly. What I would like to do would be to retest the herds in which we find even a single reactor, within three months, in order to get the animal that may have the disease in the incubation stage before the disease has evolved to the point where it may be transmitted to other animals in the herd. Now, if we can only do that, we are getting where we can control the situation very nicely. And I will confess that the results that we are getting now are much better than I had expected, in view of the method in which we have carried on the work.

Just at this time, too, I am going to take the opportunity of referring to the matter of meat from carcasses of reacting animals being sold for human consumption. Periodically we find a lot of agitation carried out from different sources regarding that question. Now, we do allow meat from the carcasses of reacting animals to be sold for human consumption, provided it passes a severe and rigid inspection. That inspection is more rigid than the most rigid meat inspection carried on anywhere else in the world. In order that you may be sure that you are getting good meat free from disease, I would suggest that the best practice would be that, where you can get it, you should buy the meat from the carcasses of reacting animals, because only meat that is fit for human consumption from that source finds its way into our meat market. I am presenting that problem in rather a peculiar manner, but the common argument that we meet is that milk from an animal that is unfit for human consumption indicates that the carcass will be unfit for human consumption. Now, we don't say that milk from all of these animals that we condemn as reactors is unfit for human consumption. We know that much of it is absolutely free from tuberculosis, but we have got no method, no practical method, of determining whether or not the milk from certain cows is not likely to contain—well, contain the germ, or the tubercle bacilli, while in many cases it may. The bacteriological test for tubercular bacilli is not very simple—or, at least, it is a little more difficult than the ordinary bacteriological test of milk; and sometimes we might find germs present in certain tests, while in other tests the milk from the same cow might appear to be free. And then, too, we believe we are safe in assuming that in the majority of these cases sooner or later that animal will reach the stage where it will be positively dangerous as a milk-producing animal; and not only that, but that animal is spreading the disease to other animals in the herd, or may do that; and I hope, at least in discussing this question, in setting forth the reasons why we should have tuberculin-tested cattle, you will not fail to mention the economic side of it, as well as the public-health standpoint.

I believe that one of the reasons we have made the progress that we have made here, and that we have secured the sympathy and the support—I should not say sympathy, but the support—of the dairymen, is that ever since I have had charge of the work I have at least tried to point out that the dairyman could not afford from an economic standpoint to have a diseased animal in his herd, otherwise he is likely to feel that he is bearing the whole load, that he is paying the bill for public health; whereas, if he is brought to look at it from a broader standpoint—and most of us do not look at it from that broader standpoint—he is going to take more kindly to work of this kind.

Since I came here this morning it occurred to me that we might have arranged rather an interesting side-trip up to P. Burns's abattoir, and I thought that at the time, as we had brought over this week quite a large number of reactors to be slaughtered at P. Burns's abattoir, it would have been very interesting and instructive to have arranged, immediately following this Convention, to have had these animals slaughtered in order that you might have an opportunity of making a study not only of these diseases in our cattle, but also the inspection or the method of inspection carried on at P. Burns's abattoir. Unfortunately, P. Burns's abattoir is the only place for the inspection of reacting animals where there is meat inspection in British Columbia. We are working under rather a peculiar system in Canada and the United States; that is, it is assumed that if we are exporting meat outside of the Province, in the United States outside of the city, it must be inspected. That is, if we are selling it to somebody else we must give them a good article; if we are using it at home it doesn't make any difference how badly diseased it is, it is all right for our home consumption.

At the previous meeting of the Medical Health Officers I advocated the institution of public abattoirs, municipally owned and operated abattoirs. Now, there are some difficulties in the way, but it seems to me that the only solution of this inspection is that we have municipally owned abattoirs where Government Inspectors or municipal Inspectors will be stationed. It is impracticable under present methods to inspect every little product at the slaughter-house, and probably it would be to-day in the field or the bush, particularly if it happens to be flooded with tuberculosis or some other disease. Some of the diseased portions remain there and the remainder of the carcass is brought into town and sold for human consumption. Now, if there is any doubt in the minds of any person regarding this meat inspection or the sale of this meat, the advisability of its sale, I would be very glad to hear from you, and I would be very glad to have a full expression of your opinion. In the inspection that is carried on where the animals are sent to P. Burns's abbatoir, there is some inspection, they are slaughtered under Federal Inspectors; but where they are slaughtered elsewhere, it is under the supervision of our own Provincial Inspectors.

The question of pasteurization has been referred to you, and this is a question which we always have at a conventional gathering of dairymen and those interested in the milk question—quite an argument or discussion. There are different phases of pasteurization, as has been pointed out. There are things to be said in its favour, and there are other things to be said against it. Pasteurization as it is carried on commercially is not perfect pasteurization. Now, we might say here that pasteurization will solve the problem, but when we go to the dairyman he says that he cannot sell perfectly pasteurized milk, due to the fact that you cannot secure perfect pasteurization without destroying your cream-line, and the dairyman cannot sell milk without the cream-line; that is, unless there is cream on the milk, unless the cream rises, the customer does not want it, because the majority of customers pay a great deal more attention to the cream-line on the top of the bottle than the dirt on the bottom of it. Under commercial pasteurization the nearest we can get to complete pasteurization is 98 per cent. of efficiency. Now, that is up to the present time the very best pasteurization in commercial plant, and you will understand that a great deal of it is going to fall away below that in efficiency. You are leaving, then, a certain percentage of your bacteria in your milk, and you may be leaving pathogenic forms in a field more favourable for their development than was the milk before pasteurization. Personally, I would not care to use pasteurized milk; that is, if I thought the milk was dirty, filthy, and was compelled to use it, then I would want to pasteurize it of course; but I would not want any one else to use it, and in our own home we do not use pasteurized milk, but endeavour as far as possible to get a good wholesome supply of whole milk, raw milk produced under sanitary conditions.

I am leaving certain other phases of the subject of pasteurization to Dr. Wesbrook, if he will be kind enough to discuss them, as Dr. Wesbrook understands the point to which I refer —namely, the influence that pasteurization may have on the food value, particularly the food value for infants.

A short time ago in the Pacific North-west there was what was known as the Pacific North-west Dairy Milk Inspectors' Association, which to my mind is the most influential associationn, the most influential factor in the matter of milk-supply of the North-west. You will remember that a year ago, or a little over a year ago last spring, we held the convention of that association in Vancouver. Although I was the only Canadian member in the association, the association was kind enough to hold its convention here in Vancouver. I regretted that we did not have more of our consumers and more of our Medical Health Officers present. I know that many of our municipalities are pretty hard up, and Victoria, although the distance was very short, after due consideration decided that they could not afford to send their Medical Health Officer over to Vancouver to attend that convention; and we cannot expect other cities farther removed, more distant, to send their Medical Health Officers, although I think all who were present will agree that it was a very excellent convention. In promoting that association we hoped to be able to accomplish certain things in co-ordinating milk inspections, and a few of us gathered together in Seattle decided that it might be advisable to bring in dealers, purchasers, and consumers into our convention, give them associate membership, in order that we might have the benefit of their advice and opinion, because if a certain group of men engaged in a certain line are all working together, and alone so to speak—say, for example, a group of Medical Health Officers—they may overlook some point which perhaps a man engaged in another line of work might think of; and we have found the advantage to be far greater than we ever anticipated. Outside of our association—at least, from that association subsidiary associations have been formed, and I hope that we will be able to have conventions of all our Medical Health Officers from the Province of British Columbia. The next convention will be held in Spokane.

Dr. Proctor referred to milk coming from south of the boundary-line. I believe at the present time that we are not having any milk coming from the State of Washington, although at the time he was acting on that Milk Commission there was a very large amount of it coming from the State of Washington; and, by various means, that was shut out by the municipalities enforcing regulations which they were empowered to draft under the "Milk Act," requiring the same inspection that we were enforcing in British Columbia. The Province was not able to do it, but the Province was able to give the municipalities power to do it, although we could not do it ourselves—at least, our department could do nothing in the matter.

Another point mentioned, that of a central milk inspection station, has just recently been adopted by the City of Tacoma. I don't know just how it is working out, although I have no doubt it will prove quite satisfactory. This is a very big question, and I am sorry that I have transgressed so much on the time, but it is a question in which I am very deeply interested; and I hope to hear further, and especially if you have any opinions contrary to those I have expressed, I would be very glad to have you express them, as it would be of assistance to us in our work. (Applause.)

The Chairman: The paper is open now for further discussion. Dr. Wesbrook's name has been suggested as one having information on this. May we hear from Dr. Wesbrook?

Dr. Wesbrook: Mr. Chairman, Ladies and Gentlemen,—Some of you have been more than kind in listening to me. I have been talking too much this morning and had not expected to speak this afternoon, but to sit here and learn. There are a good many things that are of importance to us which have been brought up in the most excellent paper which has been presented and the discussion which has followed. I was glad that the reader of the paper laid a special emphasis upon the important factors in the production, handling, and distribution of milk from the time it left the cow until the time it came to the consumer. Dr. Proctor added to that, and Mr. McDonald told us about the inspection for tuberculosis. Those are the factors that are important in the handling of milk. It was expressed at one time by a colleague of mine in a literal way, which exactly corresponds with what the reader of the paper said: Since milk is an excellent medium for bacteria, and since temperature is a factor in the growth—a Provincial factor at least—and since it is ordinarily taken from the cow in a very careless way so as to allow the milk to be polluted, you might express the needs literally as I have said, something like that; it means handling it quickly, cooling it at once, and, of course,

cleanliness is the most important. Now, those are the important matters in the handling of milk.

About its production, we have had quite a bit of discussion to-day, and they have all pointed out the difficulties in the handling of milk. We know here that it is not a matter of getting a milkman and going out and picking out a cow from which you want your milk, picking out the person who is to milk the cow and keeping him under medical supervision, and the cow under veterinary supervision, and the railroad, and the man that drives the milk-wagon, and various other things; that is not everything, for if you have to do things on a large scale, particularly as the milk-supply for a large city comes from a great distance—Dr. Proctor tells us it will come into the City of Vancouver in a good many instances from across the border. Now, take a place like New York, you must remember that they draw for their milk-supply from the country half-way to Chicago. When they get an epidemic of typhoid in New York which is supposed to be due to typhoid, they make an investigation of conditions on the farm; they investigate the people on that farm where the milk was produced, and that may be anywhere from 50 to 250 miles distant, or perhaps 500 miles, more or less, distant, so these are things which we have to recognize. Now, can we get any one single fool-proof proposition that is going to safeguard us? And that brings us to the point of pasteurization. Now, that is the nearest thing that we can do. We have already seen the difficulties of pasteurization. We have seen that under commercial conditions only about 98 per cent. of the non-spore-bearing bacteria are killed. However, that is pretty good; and that is only under the very best conditions. You have heard about holding the milk at a certain temperature, the flash method, where they shoot it through a tube, where it goes through very fast; but apparently to secure good results you must hold it at this temperature, and since it is important that the milk should not be too high, it must be held at that temperature longer than it would need to be held if it were higher.

Now, the difficulties you have in pasteurization have been mentioned; here are a few more: In addition to the one that milk which is rotten—I use the word advisedly, I think—in addition to the belief that rotten milk can be made all right by pasteurization, we have this fact: that after pasteurization your milk is more likely, if it is kept too long or in bad condition, to be very problematical as to its condition than if it had not been pasteurized.

Now, the common bacteria in milk are those which sour the milk and produce lactic acid. Lactic acid is in itself antiseptic, and that again which the reader of the paper gave us, if these bacteria were largely lactic bacteria they would not harm you particularly. Most of the bacteria passed through by this process, but you leave in the spore-bearing, putrefactive bacteria, and the fermentation in pasteurized milk is much greater than the bacterial fermentation in unpasteurized milk; that is, you get all the bacteria which putrefy and which rot, which form spores, and they are left in there, and although they may be relatively few in number, if you don't keep it very cold and don't keep it too long it may be all right; but the curds you get on that kind of milk are quite different from the cheese-curds you get from your lactic acid, so that you might just as well be eating rotten meat as drinking rotten milk.

Now, that brings me to the idea that in all cases where it is at all possible milk ought to be examined where it is brought from, so that everybody should know how old it is, because even certified milk where perhaps you don't get over a hundred bacteria, which is supposed to be the most desirable milk, milk for which you pay probably 20 cents a quart, if you keep it it will be all right. Now, another thing about pasteurized milk, to which Mr. McDonald referred—and it is like what Dr. Adam Shortt said about politics and other affairs the other day at the University Club. We are not faced with a clear-cut decision usually in our lives, as to what is quite right and what is quite wrong. It is usually between one thing which seems to be a little more right than another, or the choice between a minor and one that is greater. So it is with your milk. I have indicated here some of the difficulties of pasteurization. Here is the other way: As yet we don't know, we haven't data enough, in my opinion, to say whether pasteurized milk contains all the things that are desirable for young children. Now, take the matter of growth, we are learning a great deal about vital statistics, and we know these are things that are present in three food products that heating in a great many instances will eliminate—but I think that can be taken care of; but I am on the side of pasteurization; although they can be taken care of as we go along by special conditions, which will give us something raw—it may be a vegetable product—which will look after these things. We have sometimes scurvy right here. We don't have to go to the North Pole to get scurvy, and we have to look out in getting at the vegetable

products or other things. However, from my personal examination, like Mr. McDonald, I should prefer to have a milk that is produced from a cow that has been tested for tuberculosis and found free of tuberculosis, and retested again in three months, so that if it had the incipient bacilli I would like to know that these few bacilli had been grown from a real case of infection; and, secondly, that that cow should be inspected for other conditions besides tuberculosis. We must not think, when a cow is pronounced free of tuberculosis, that it may not have other things about it which may be harmful. Thirdly, I should like to know that that milk is handled by people who have been medically inspected. (Applause.) Now, that is very important. However, I am transgressing somewhat. I would like to say a few things about milk epidemic, that is important; and then I should like to know that it was so handled by that healthy person that he did not get cow-manure or any other objectionable things in it. It is not so many years ago that the Germans startled us by having one of their number report the number of tons of cow-manure that went into Berlin in one year. We might as well look those things squarely in the face. Fortunately we are not so susceptible as a cow to many diseases, but we might as well face some of these things. Then I should like to know that it had not been milked in a dusty place, that the cow had been washed out; if it had been milked by milking-machine, that the milker's hands were clean. He need not have on a whole white-duck suit, and he need not milk in an operating theatre. That is where the milk used to cost so much, certified milk cost so much, they thought all these things were necessary; but if you just keep the dust out, keep your hands clean, keep the teats of the cow clean, and keep your milking-utensils clean, we have found now that certified milk can be produced very reasonably; and I feel quite sure that Dr. Underhill—I hope he will show us some samples of the very good milk that has been produced in Vancouver under his supervision. I think that we may say that we have a very good milk-supply in Vancouver, as a general rule. I know, before selecting my milkman, I asked Dr. Underhill's advice. There is no use having expert opinion if you don't avail yourself of it. Now, these are the things I want to know; and then I would like to have that milk delivered to me, if I could, with not more than, say, 1,000 bacteria per cubic centimetre in it. Then if I don't know enough to take care of it after I get it, that is my business. I don't think any of the Government men or municipal Inspectors can follow the milk into the home. I think up to that point we should have inspection, but it must be co-operative inspection, co-operative in this sense—or international inspection—if it is going to be efficient. Now, I hope I have made this thing clear. I believe that pasteurization is the nearest thing to give us what I called, using a rather crude expression, fool-proof, something that the most mediocre brain can keep.

Now, about these diseases, we are not specific about these things. I am sure that the writer of the paper will not wish us to infer that the flies carry diphtheria from the toilet into the milk. They don't. They may carry diphtheria or typhoid or other things from a human source or from an intermediate source, like receptacles, to other people, but you don't find that bacilli are in toilet-rooms or in a pan, you find them in people's throats and noses. Sometimes, when you don't suspect it, you find it in the case of people who have had the disease, or in the case of people who have not been suspected at all of having it, who carry it.

Now, this idea of carrier is pretty general in application. I might tell you of one—I think Dr. Mullin ran this investigation—we had one time there a case of diphtheria in the vicinity of the university, along the east side; well, what should you do when you are having an epidemic of any disease? Every case should be reported at once by the physician to the Medical Health Officers. In that report it should be; then the Medical Health Officer goes out and he finds out a number of things, the water-supply of the patient, where he was for awhile, for particularly in typhoid cases you want to know what he was doing for weeks; you don't want to know what he was doing to-day, you want to know what he was doing for weeks, where he was infected; you want to know his milk-supply. Well, these men came in and they said that it was the milk-supply where they detected the presence of bacteria. And in this case he was the best milk-dealer in the City of Minneapolis, and he got a very black eye, and it was very very unfortunate, because he should have been encouraged in every way; but those were the facts. What did we do about it; what did Dr. Mullin's colleagues do about it? Did they go and examine samples of the milk? No; they went out to that man's dairy and they took swabs from the noses and throats of everybody who had to do with the milk, and they found a Swede there who had only been in the country for a few weeks, but he was a good carrier, and he had diphtheria in his throat and nose. He may have talked or he may have sung or he may have sneezed, or something

of that kind, over the milk. Anyway, that was the dairy. You see, it must carry down to actual observations. How can you theorize when you cannot get any further? You are supposed to begin the theorizing when you cannot find out anything more. In a case of typhoid fever, in the same way you find the cows don't have typhoid fever. You can't get typhoid fever from a cow, you can't get it from any mysterious source; you get it from the individual who carried the typhoid. "Typhoid Mary" is perhaps more historical than anybody else. Now, they didn't know what to do with it. She seemed to have all these bacilli in her system, the typhoid bacilli. That is not her fault, but it is her misfortune, and somebody else's. They had her on the island for quite a number of months; there was no legal machinery to hold her. She might just as well have all her boxes and her hands full of bonds so far as the community was concerned. She is supposed to have been the cause of twenty-two different typhoid outbreaks.

They found on a Russian estate some years ago a woman who was a typhoid-carrier, and had been for seventeen years, and she had been distributing typhoid; she had been the cause of typhoid outbreaks for a number of times because she was in the dairy of that estate. Now, as soon as anybody gets diphtheria or anybody gets typhoid, and you find one of these people in a dairy, you have got to get control, cut that dairy off for the time being; then you have got to segregate that person and cut him off in the meantime until you have examined everybody else in the whole household and the whole establishment, until you find out by this examination that they don't have diphtheria or that they don't have typhoid. That is where you are getting milk that is not pasteurized, and you ought to do it, anyway; you ought to do it, it is good business from a public-health standpoint. So it is with your tubercular bacilli; as Mr. McDonald pointed out, the main factor involved in tuberculosis was not perhaps the question of public health, because perhaps a different person—I mean you have a number of percentages—there are only a limited number of percentages of those cases in which you cannot find the tubercular bacilli of the bovine type. Of course, there is another disease group, where you find children infected in infancy; there may have been a change from the bovine type to the human type, but nobody can prove it. There is no conjecturing about it; but the main consideration is of the cow only. You cannot afford to have tuberculous cattle; they don't produce as much milk, and if they are beef animals they will not as a rule take on beef so fast; and, furthermore, he gets his whole herd infected; and we have seen to-day that it is to his interest to get rid of tuberculous cattle, and if he does that then we will be safe.

Now, you see, in all these cases we must keep quite clearly in mind that there are definite special methods for finding out these things. You do not examine a sample of milk for the tubercle bacillus, you go and see if you can find the cow that is tuberculous. You don't examine the milk to see if there is any typhoid in the milk, you go and find out whether there is a case of typhoid, or whether the man who is handling the milk or his wife is sick with typhoid, or whether, where the case is water, for the purposes of dilution or perhaps for domestic use, it is on a farm where they have typhoid, and you go and examine the individuals to see whether they have diphtheria in their mouths or noses, diphtheria bacilli; and that is the reason that medical inspection of the people who handle the milk is very very important. But as a last safeguard it seems to me that we will be driven to pasteurization, but not pasteurization, as the doctor intimated, in the unscientific commercial way that the commercial man sees it. We will come to have city pasteurization. We will probably come to have a city system, because you must not blame the producer now for the high price of milk—alone, I mean; you must not blame the producer alone for the high price of milk, for that producer only gets half of what you pay for his milk; but if you are going to insist on each one of us having a separate milk-wagon driving up to his door and then driving off a quarter of a mile before he reaches his next customer, when right across here there is another milk-wagon doing the same kind of thing, that is not economy. That has been pointed out. We have had it up before; I think we were discussing this at the food-control meeting yesterday. Mr. McDonald, I think it was, told us that they are getting so particular now in certain places, competition is so keen that they have a separate milk-wagon going down one side of the street and he is not allowed to run across to the other side with a can of milk; he just takes care of those houses in that row, and there is another one for the other side. Now, that is what German economy can do; but we can flatter ourselves that we have a very much better supply than Germany has, just the same, because we have been trying to educate the people with meetings of this kind.

Now, this is not a small problem. It is going to cost you more if you are going to have this kind of milk; but we heard this morning that health was a purchasable commodity, and we still hope to get from Mr. McDonald, if he would tell us his opinion, that not only is this the one article that contains all the things needed by everybody, but that after all, even at the present high price, it is the cheapest food that we can buy; so that makes it, I think, one of the most important things with which we have to deal, and that is the reason that co-operation is so necessary; and I hope that before we get through the organization will advocate pasteurization of milk, as being such an important article of food which should be used by everybody, a great deal more than it is.

I beg your pardon, Mr. Chairman, but this is an important matter and I was carried away, as I am so liable to be when I get interested. (Applause.)

Mr. McDonald: Mr. Chairman, if I may be allowed just a word in regard to this question that Dr. Wesbrook referred to; there is in our office, if any of you have time to read it—I haven't yet had the time to read it thoroughly—a report from the Wisconsin Experiment Station which shows the work they have carried on, that the vegetable oils do not contain the principles of this growth that is contained in these other things. It may be that some one present has read this report. I just glanced over it hurriedly.

The Chairman: Is there any other member who would like to discuss this paper?

Dr. Petersky: Mr. Chairman, Ladies and Gentlemen,—All this theorizing about milk will not help me in my work. As we all know by this time, I am in the country. What I want to know is how to get pure milk in the community under my jurisdiction; that is my particular difficulty. The same information that you get here can be obtained by reading the papers of others. I have learned a great deal by hearing these papers, but what I am going to carry away from this Convention is this: that everything in public health is a purchasable commodity, anyway, and pure milk is one, and it all comes down to a question of money. Now, just to give you a little illustration in our community: The milk comes along in a baggage-car to the town, and if the train is late the milk is spoiled before it gets there. The result is that condensed milk is used. Now, we have all heard about the infant mortality, and I believe in providing cow's milk where infants can progress favourably. Now, what are you going to do there? You all know what is said about using condensed milk. Condensed milk contains carbohydrates which are very bad for infants. Now, we are up against it there. The merchants, however, say: "If you pay me more for the milk I will get it transported specially in a box of ice." In other words, you will have to pay freight on the ice as well as the milk. And what do those people do? They absolutely refuse to pay another cent for that milk, and as a result I have had some babies there with diarrhœa, the mothers have been unable to get them what they wanted. I gave them modified cow's milk; that is what I prescribed. Where are they to get the milk? The milk came in one day, the train was late, and the milk was spoiled before it got there, and the merchant refused to take it. As a result there was no food for that child unless they used condensed milk, and I had to condemn it. Well, you are up a tree.

You were saying it would be a good idea to have a central milk depot, that the city shall deliver. I say, why not the Government deliver to communities of a certain size. If you want to have the babies live there is a way to do it. Then, on the other hand, that brings us down to that question, if it were going to mean a difference of life and death for their babies they might be willing to pay an extra 10 cents a quart which they absolutely refuse to pay there.

Now, as regards the milk after it goes into the home, if I may be permitted to disagree with Dr. Wesbrook, I say no, by all means, it is not our own business. It is all right for Dr. Wesbrook and for men who know when they have good milk in their homes; but these ignorant people, and we find, I might say, over 90 per cent. who don't know what to do with it when they do get the milk in the home, they should get that education that we have been talking about all day yesterday with respect to child-welfare, and so on, as to what to do with their milk. If they don't know what to do with it, I don't see that they should be allowed to simply lie down and die. I think that is one of our duties as Health Officers and the duty of the Health Department to teach these matters. That brings us back again to the high-school girls getting lectures on that point. Now, if the Chairman will allow me to mention that subject, although it is not on the paper——

The Chairman: You will not be long?

Dr. Petersky: No, just for a moment. I just want to call your attention to the question of food inspection by us. The Health Officer in the country is supposed to be a check on all this. They have to examine the carcasses. Now, what do I know about meat inspection? I might do a post-mortem perhaps, and know a little about pathology. Now, I was called in a particular case, and I read through my "Health Act" thoroughly, and found that I had the power to condemn, under the "Health Act," that which I thought was unfit for human consumption; and this particular carcass, I did not attempt to use a medical expression, the symptom alone, but the symptom complex of the whole case; in other words, I tried to use my head. I found one man that sold meat was notoriously a man that was very, very severe and would not undersell to anybody else, and he sold it so cheaply that it aroused my suspicion. And then the carcass itself. I had never examined meat before; well, I simply told the sanitary officer—the Provincial policeman—I said: "I wouldn't eat it, and I don't see that anybody else should." Well, the meat was condemned. I had to leave that place for a few days, and some sea-lawyer advised him to send a sample to the Department for analysis, and that they would put it over me. I saw the letter; it arrived the day that I came back, and the Provincial police showed me: "This sample contains actinomycosis and the carcass is unfit for human consumption." And the Government Inspector was sent up to examine the herd. Now, that shows you what we are up against in the country. Another thing: Meat is sold in some places the day that it is killed, and it was always with fear and trembling—there was no other way of getting it—I eat that meat myself.

Now, I take it that this Convention wishes that all the problems that we have and that have been discussed here should be looked into, as they are not easy to get over. (Applause.)

Dr. Underhill: Mr. Chairman, Ladies and Gentlemen,—We have heard the scientific side of the milk question, but we poor Medical Health Officers have another side—the practical side—and that is what I want to deal with at the present moment. It is always instructive to meet a man who can give us a paper such as Dr. Price has given us to-day, and I wish to congratulate him upon his achievement. Looking at the matter from the practical side, I cannot see of what use it is to have laws if they are not carried into effect. The Acts of British Columbia relating to milk are plain and straightforward, and it is the duty of all of us to see that they are put into practice. I regret to say, however, that they are not put into practice.

Now, Mr. McDonald has taken the sting out of what I wanted to say, because he has honestly said that he has neither the money nor the Inspectors necessary to properly carry out his work. Now, just keep that in mind. Don't run away with the idea that all the herds in British Columbia are tuberculin-tested to anything like the extent they ought to be, for they are not. I am simply stating facts—facts that I can prove; and Mr. McDonald can bear me out. It is quite true that they want money; it is quite true that they want Inspectors; that is not my business. My business is to see that the milk-supply of the City of Vancouver is from tuberculin-tested herds, and I say it is not. There may be a small percentage, but it should *all* come from tuberculin-tested herds. We hear that the farmers object. They may have a good reason for objecting, but I am not speaking from their point of view; I am speaking clearly from the point of view of the Health Officer who has the care of the milk in this city to-day. Dr. Wesbrook was perfectly correct in stating that we have a very excellent supply of milk here, but it would never do for any Health Officer to sit down and be content with anything. (Applause.) Therefore, if the Health Officer is doing his duty, he has always got a kick, always a grunt, coming; he should have in this business. Every one else is kicking at him, and he should have an opportunity of returning that kick. Now, the "Milk Act" here is all right; I don't object to it, but it is the manner in which it is enforced that I object to.

Dr. Price mentions the sterilization of utensils. That is a very excellent thing; I think they should be sterilized, but, like most other things, when you come down to actual practice it is not carried out—it is simply played with. Why is it neglected? Because the farmers and dairymen don't know what they are doing. Of course, there are good, bad, and indifferent farmers, as there are good, bad, and indifferent men in every branch; this is not intended as a reflection upon them, but I am telling you what we must face as Medical Health Officers. We may imagine that these utensils are sterilized, but they are not. They can't be sterilized; the farmers haven't got the machinery to sterilize them, and they haven't got the system to sterilize them.

Now as to the question of the classification of dairy farms: What has classification done in the past? It is a puzzling phrase. With all due deference to Mr. McDonald, I say it is an absolute farce. Every farm that does not come into Class A or B is in Class C. Class C is the ultimate quantity; you cannot get down any further, and so to save the face of the farmer they put his farm in Class C. You might as well call it Z or anything else. I don't know that we have any milk coming from Grade B farms. Of course, they may have altered recently from what they used to be.

Two or three years ago I brought this matter to the attention of the Secretary to the Provincial Board of Health, and he seemed very much exercised about it. The Inspector has gone to the farms and graded the animals, but not the dairies. Now, Mr. McDonald will tell you that there is a gentleman appointed for that purpose—to examine the dairies. Is that correct? Is there any gentleman appointed to inspect dairies?

Mr. McDonald: You mean municipal dairies?

Dr. Underhill: No, outside dairies; I might use the word "farm."

Mr. McDonald: We have got no Inspectors.

Dr. Underhill: You have got no Inspectors? I thought you had one for that particular purpose.

Mr. McDonald: Well, his duties do not take him over this whole thing.

Dr. Underhill: What I mean is that the Veterinary Inspectors should inspect those dairies. Well, it comes to the same thing, that there is no practical dairy inspection of the farms. I may have used the word wrongly there; I was not thinking of city dairies, I was thinking of the source of supply. The fact is, from my point of view, there is no true inspection of these farms, and the classification, taking into consideration the condition of some of the farms, is not equitable. It is not fair to the good man who has an excellent farm that he should be classed with a very indifferent man.

Now, as to the milk in the home: Since the introduction of the bottle there has been comparatively little trouble in keeping the milk good in the home. In the old days, when the milk was carried round in bulk, it frequently happened that the utensils placed for its reception by the householders were anything but clean; consequently the milk would not keep and the dairymen got the blame. To a great extent this has now been done away with, but there is a great deal to be done yet in educating our people as to how to take care of the bottled milk. Well, to speak the truth, I have had some difficulty in my own house, and if you have difficulty there you may expect to find the same conditions prevailing generally. The bottle of milk is brought in from the cooler and a certain quantity taken out of it for immediate use; the bottle is forgotten and is left often in the warm kitchen, and then after a while taken back to the cool receptacle. It is this change of the milk from one temperature to another that is so detrimental. If it was kept at an even temperature there is no doubt that it would keep much better.

With regard to infectious diseases, inquiries are made in every reported case as to the dairy from which the milk is obtained; by this means, should it be shown that the same dairy is supplying milk in several cases, it might be possible to trace the disease back to its source. I would recommend my brother Health Officers also to keep tab on the milk-supply in cases of infectious diseases.

With regard to diseases carried by milk, I believe that impure water had a great deal to do in the past with many of our tuberculosis cases, or typhoid cases particularly, possibly through a drain on the farm leaking into the water-supply which was used for washing out the cans—or possibly for adulterating the milk. Now, however, that the milk is being purchased from the dairies on the butter-fat basis by weight, there is not the same temptation to adulterate it.

Pasteurization I simply look upon as a means to cover up dirt. That is my personal opinion about it. Samples of milk are taken from the dairies at frequent intervals for bacterial examination, and it sometimes happens that the count in a particular sample is especially high. A special inspection of the dairy is at once undertaken on the assumption that the milk may have been contaminated at the dairy. Samples are taken at different points of the machinery and examined for bacteria, and the cause of the trouble may thus be located. This is one of the most important duties of a Health Officer, to find out the point of trouble and see that it is corrected; and this is where the bacterial examination of milk is especially useful.

A question has been asked with regard to milk coming from Washington. Some time ago we were getting about 3,000 gallons a day from that State. Now, I have inspected many of these

dairy-farms personally, and I wish I could say that ours compare favourably with them, but they do not. In addition to that, the milk received from there conformed with all the regulations of this city. The herds were tuberculin-tested by competent men and the certificates were produced to my department, and I wrote to the State Board of Health of Washington and obtained a list of veterinarians who were authorized to apply the test. It does not matter whether the milk comes from Washington or China as long as it is all right. At the present time I don't think there is any milk coming across the border, only a little cream.

All these things have a bearing on economic conditions. You have to be very careful in putting your Acts into force, because if they are enforced too stringently the milk may be diverted to other uses; the farmers may send it away for cheese or butter, and as far as I know there is no inspection made of milk for that purpose. I do think that if you lay down regulations that are too stringent, you have always before you the question of a milk famine, for which we should be to blame.

There are many other little points that I might touch upon, but I think it unwise to prolong this discussion further, and will simply say that I am glad to have been here and to have heard such an excellent paper.

Mr. McDonald: I think I should be allowed a word or two. I might say that to my mind we have in British Columbia provided a more healthful-milk supply than they have in any other Province of Canada. Now, I can say that without any fear of successful contradiction; and I too, perhaps, am somewhat optimistic in my work. If I wasn't optimistic they would have me over in Westminster in the " bug-house " before very long. However, Dr. Underhill may have left the impression quite unintentionally that there is no inspection of dairies to speak of. Now, there is inspection of dairies, and our Inspectors——

The Chairman: Excuse me, may I ask you to confine yourself as closely as possible to answering the matters connected with this paper which Dr. Underhill raised. I think he said, not the dairies, but the farms.

Mr. McDonald: That is what I am referring to.

The Chairman: All right, thank you.

Mr. McDonald: Yes, and the farm dairies, if you wish to put it that way; and I have the grades of these dairies, they are coming in there every day. Dr. Underhill also said that there was no limit to the filthiness of milk in Class C. Now, Class C reads thus: (reading). Class C is a very good milk as milk goes.

The Chairman: I think we have all enjoyed this discussion, and we might prolong it almost indefinitely, and still to profit; but I think that at this stage we will have to ask that any one who wishes to go further into it will bring on a resolution asking Dr. Young to bring it up at the next session of the Medical Health Officers, so that we can get more on this line.

A member: I would like to know if there is any other subject——

The Chairman: In fairness to the other subjects on the programme, I think we must close this discussion. There is lots more to be said, but there are two other papers on the programme, so unless you insist on the resolution I should ask Dr. Price to close the discussion.

Dr. Price: Mr. Chairman, Ladies and Gentlemen,—I was very much flattered by the amount of discussion which my paper has brought forward, and in view of the time taken up in that discussion, all I have to say is to thank you for listening so patiently to the paper, and I think I have derived great benefit from the discussion that has been brought forward. I do not intend to make any further reply, because the time is getting on and we have some excellent papers to follow. (Applause.)

The Chairman: There are two other subjects on our programme this afternoon, both of them of great interest. The first is " Rural Sanitation," by Mr. W. J. E. Biker, District Engineer, Nelson, B.C. The discussion on this paper will be introduced by Mr. A. G. Dalzell, City Engineer.

RURAL SANITATION.

By W. J. E. Biker, A.M.Can.Soc.C.E., District Engineer, Water Rights Branch, Nelson, B.C.

Mr. Chairman, Ladies and Gentlemen,—Public health or the science of living together in large communities with comparative immunity from disease is, when analysed, simply a matter of education. I think you will agree with the statement that it is the chief function of a medical practitioner, and particularly of a Medical Health Officer, to solve problems, and to obtain not only a solution, but the best solution considered from all points of view.

The effectiveness of the Medical Health Officer in the fulfilment of his duties is very largely dependent upon the support given to him from headquarters, but more particularly from members of his own profession in the education of the public to proper policies of sanitary administration. To be a success the doctor holding such a public position must have the collective support and advice of his profession. In other words, I maintain it is "up to you" on every possible occasion to educate the public mind regarding the simple function of living, in order that we may not be a menace to ourselves or those around us. To illustrate: Most people wash their faces to suggest cleanliness, unless they are indifferent or wish to be regarded as abandoned characters. Would it not be possible to introduce precisely the same feeling, that there is want of propriety in not attending to or keeping perfectly sanitary all the domestic offices that are essential to the health of individuals as well as communities?

The need of community co-operation has grown more and more urgent with greater concentration of population, and with the development of conditions in America similar to those which have existed in Europe for between one and two centuries. Such undertakings as water-supply, drainage, sewerage, prevention of pollution of our streams, town-planning, park-developments, and particularly sanitation or hygiene, are all accomplished much better under united or centrally directed effort.

It is no longer right for any unit, be it a community or an individual, to disregard the rights of others. We must not lose sight of the sovereignty of the State or the fundamental requirement that individual communities, as well as persons, must give way to the common good and the ultimate need of the most good to the most people. Many of you may say: "But what has all this to do with a Medical Health Officer?" To illustrate the point, I will digress into personalities for a moment. Some of you may not have given the matter a great deal of thought, but as members of an old-established, honourable profession each one of you exerts an influence in your community which is second to none in that community, and particularly so in matters relating to health. In fact, you have under your control (in a very great measure) the health of the people within your area, and whether the contributory surroundings of the people are sanitary or unsanitary is a matter that is up to you for mitigation. Therefore, I say you are the custodians of a very noble trust, and have the power within your grasp of ruling or guiding the majority. Since all our laws and institutions receive their sanction by the ruling majority, you, gentlemen, in so far as sanitary legislation is concerned, are therefore the motive power of the people.

It is the boast of science that its only quest is truth, and that in its pursuit the inductive method of research is never departed from. The average lay mind has become so accustomed to accepting as truth whatever bears the scientific label, and as valid whatever conclusions are alleged to have been reached by the process of induction, that it is now a comparatively easy matter for any of you to wield this potential asset for the good of the people. In other words, to inculcate in the people the simple study of cause and effect as it might be applied to living.

Upon whom rests the responsibility of the contagious infections or epidemic diseases that quietly take their toll of human life? Who can be blamed for permitting many of the preventable diseases to thrive in this enlightened age? Is it the Governments, the municipal authorities, or the people themselves?

A Province or State may start out with the best intentions in the way of legislative enactments to protect the public health. This is simple, for none but the framers of health laws really know what they signify; hence there arises no antagonism to their enactment. The trouble or cause of these laws not becoming a real factor in any community is, in many cases, the lack of adequate financial appropriation. The average sum available *per capita* per annum for the enforcement of health regulations for cities having a population of 25,000 or more is only about 30 cents. In looking over the estimates of the Province for the ensuing year, one finds an appropriation of $50,708 for public-health administration, or, worked out on a *per capita* basis (on an assumed population of 400,000), a little over 12½ cents per head.

Secondly, the officers in charge of such administration have to go about the country almost apologizing for causing any trouble, and in fear and trembling of the political pull that Jones or Smith (whom they have just reported) may use against them when opportunity offers. I speak this to the shame of all political persuasions, both here and elsewhere, and add, without fear of contradiction, that no efficient public-health administration can be formed unless, in the first place, you can secure men who are capable of acting above personal interest, and, secondly, give them adequate protection and continuity of service to make it worth while.

The *status quo* of the sanitary problem in this Province to-day can fittingly be compared to that of England prior to her acquiring a dense population. The laws governing the public health were and still are good, and gave to the officials all the power necessary, with what result? Sewage-disposal, the unrestricted pollution of the rivers and streams, increasing death-rate, and other factors took such a toll of the best lives in their midst that finally arrested the attention of Parliament to the issue, resulting in the appointing of a Royal Commission to deal with the question of sanitary legislation. This Commission has been in existence for seventeen years, and the expense and results of the findings of this tribunal have cost England millions of pounds sterling. Now comes the point to be made, and surely we are able to draw something from their experience. We are still in the initial stages of development, and I take this opportunity of going on record, in September, 1917, to the effect that we in this room have it within our power to save British Columbia and its future administrations from the condition that Great Britain found herself in when she appointed her Royal Commission for the protection of public health. Over there, through bitter experience, they have learned that sanitation almost amounts to a religion, and even at this time, when we are fighting for our very existence, they are debating the advisability of creating a new portfolio to be named the Ministry of Health.

I do not propose to detain you with figures, but give to you a problem to work out for yourselves. How many of us have conceived the value of a human life in actual dollars and cents, the producing and earning power of that life to the State, to the community, and to the home that has cradled it? Taking as an index to our attitude towards the various administrations of the people the actual cash set apart for those administrations, we find that more value is placed on a stick of timber than on a human life. For forest-protection we spend on an average $1.25 *per capita* per annum, as compared with about 12½ cents *per capita* for the preservation of human life.

These opening remarks may have the appearance of being very dogmatic, but my justification for the thoughts just given is drawn from twenty years' experience in sanitary engineering, and for fifteen of those years it was my duty to administer and be daily in touch with problems regarding the public health.

The Honourable the Minister and Dr. Young have, no doubt, placed in your hands the new Sanitary Regulations, which, coupled with the "Health Act," completely cover your sphere of operations. The appropriation of $50,708 is unquestionably inadequate to obtain results, except in a small degree, particularly so in view of all the problems with which this Department has to cope. However that may be, I want to make an appeal to you on behalf of the people of this Province, that the laws you have to administer and the problems under your control are questions apart from the remuneration you may receive. Therefore it will be observed that the one thing needed is a policy which has for its object a common ground on which we can all work for the same ends—viz., the public health.

So much for general statements. I now desire to cover a few practical points on rural sanitation, the betterment of which enlists at all times my sympathy. My work of the last six years as District Engineer in the Lands Department has been spent in the East and West Kootenay Districts, and has necessitated at intervals stays in mining, logging, and construction camps. While every courtesy and hospitality has been shown me, the sanitary condition of those camps to me is a thing quite apart. There are no figures to prove or disprove the statement that I believe between 30 and 40 per cent. of the population in the Kootenay District live under camp conditions. No doubt many of you remember having a hurried call to some of those camps and, being unable to get back, stayed the night under usually very respectable conditions. Why? Being the doctor and a visitor, the foreman or superintendent gave up his room or his bed for you. But drift into one of these camps as an ordinary individual, when the space for visitors is limited, and what do you find? A low bunk-house with no ventilation, down each side of the room a row of double-deck bunks made of boards covered with hay that has probably never been changed since the place was built, blankets that in places are stiff with body-perspiration, finally being compelled to double up with a man who has worked and slept in his underwear for weeks without change, and perhaps not had a bath since he was last in town. I have seen in a log shack 24 x 26 x 6 feet high at the walls as many as thirty-two to thirty-six men sleeping. Imagine how refreshed you feel each morning on rising. (Have any of you associated our increasing death-rate from tuberculosis with the overcrowded conditions of camps?) Anyway, you live through it, and with the strength you have left you struggle off to

the cook-house. If in summer, you find it impossible to enjoy the food because of the millions of flies. You may want a drink of water. It is kept in an open galvanized pail near the door, with a tin dipper hung just above. Under average conditions the privy is placed near the cook and bunk houses, quite close in, usually of the open type, and flies simply have a great time chasing each other from here to the cook-house.

What do you find regarding the disposal of offal, kitchen waste, slops, etc.? You find that the cook is true to type, designed on the lines of least resistance, and finding room for this material not an inch farther than he can throw it from the kitchen door-step, or it may by chance arrive in a pigsty adjoining the kitchen, and it may not. Section 66 of the "Health Act" sets forth that the Health Officer shall in every year in April or May inspect the sanitary condition of these camps, also the water-supply.

The above is a very serious state of affairs, true as it is, with only a few exceptions, and the following suggestions are given for your consideration:—

(1.) The cook is the chief regular offender in camp. Why not have him registered and make him, under penalty of dismissal, responsible for the sanitary condition of the camp? A printed set of regulations could be got up to cover all the essential points.
(2.) Log cabins should not be built to house more than from ten to twelve men, and should be provided with iron camp-beds with spring mattresses.
(3.) All habitable buildings to be whitewashed at least once in every year.
(4.) Fly-screens for all windows and doors in cook and bunk houses.
(5.) Waste, offal, empty cans, slops, and all debris to be removed daily (and kept until removal in a covered receptacle), to be finally disposed of by burning.
(6.) Stables or privy to be at least 100 yards distant from the camp.
(7.) Bath-room or shower an essential.
(8.) Good water-supply, and where possible piped into the buildings.
(9.) Earth-closet to be of approved design to exclude flies.

Camps for this purpose may be divided into two classes, permanent and temporary, distinguishing permanent camps as those having been built over twelve months.

Many other points may suggest themselves to you, but in starting a progressive movement which attacks established custom, it is first necessary to convince the interested parties that you seek their co-operation and help. On the other hand, some one may be tempted to say: "Why not enforce the law?" On this point, as in the majority of cases in health matters, the actual letter of the law is for our guidance, to be used with great discretion and enforced only as a last resource. It is often worth while spending a whole day with some men in convincing them that you are working in their interests, because, once convinced, you have a booster for your cause.

In support of the better-camp movement, it is only necessary to state that it has made possible the Panama Canal, and at this moment in France and on the Allied fronts it is preserving daily more lives than the guns of the enemy are destroying.

POLLUTION OF STREAMS.

There is an old saying that "constant dropping wears away a stone"; likewise, the constant pollution of our streams destroys their usefulness. It is a significant condition to observe that the three most scientifically advanced nations in the world, England, France, and Germany (by the standard of present knowledge), allowed the incipient pollution of their streams to overtake them, until it finally became so intolerable that vigorous campaigns costing millions of dollars were instituted to mitigate the evil. England seems to have suffered most in this regard, presumably by virtue of her possessing more inhabitants to the square mile.

With the exception of a few small streams, we are in a very favourable position in this Province (providing we realize our present opportunities) for keeping the streams free from serious pollution. If we are to preserve the amenities of our streams, a very careful and systematic scheme will have to be evolved, enlisting the aid of the greater part of the population.

The Royal Commission of Great Britain has had this problem under consideration for a great number of years, and its conclusion, as set forth in the 1912 report, is as follows:—

"We are satisfied that rivers generally, those traversing agricultural as well as those draining manufacturing or urban areas, are necessarily exposed to other pollutions besides

sewage, and it appears to us, therefore, that any authority taking water from such rivers for the purpose of water-supply must be held to be aware of the risks to which the water is exposed, and that it should be regarded as part of the duty of that authority, systematically and thoroughly, to purify the water before distributing it to their customers.

"Apart from the question of drinking-waters, we find no evidence to show that the mere presence of organisms of a noxious character in a river constitutes a danger to public health or destroys the amenities of the river. Generally speaking, therefore, we do not consider that in the present state of knowledge we should be justified in recommending that it must be the duty of a local authority to treat its sewage so that it should be bacteriologically pure."

It must be conceded that the conclusion of the Commission is sound in principle, since under average prevailing conditions water-purification rather than sewage-purification affords a better safeguard of the public health in the state of present knowledge. It also has financial considerations, since water-purification is not only more reliable, but is also cheaper under the average conditions.

It is necessary to consider the future as well as the present regarding stream-pollution, for since it is a question of degree there is a limit to the permissible dilution of sewage. It is perfectly obvious that as civilization advances and the population of the Province increases there can be no longer any streams of original purity. On the other hand, if the system of discharging crude sewage into our streams, without realizing the "limits" of such a system, the Board will have to face a condition which has cost Great Britain millions of pounds sterling.

The writer was very much interested in this whole problem in England, and it has been with increased interest that he has noticed a gradual change of opinion by all the leading experts in their attitude towards the dilution method. In this regard, it is only necessary to quote Dr. A. C. Houston, Chief Water Examiner of the Metropolitan Water Board of London, and Dr. T. M. Drown in his special report of the Massachusetts State Board of Health, wherein is stated in reference to sewage-polluted waters: "It would be necessary to drink half a gallon at once of the waters under test in order to get as much nitrogen and carbon as is contained in a single medicinal dose of strychnine, which is acknowledged to be one of the most energetic of recognized poisons." At the same time, both the above authorities are advocates of "clean rivers," but have brought themselves through their research-work to look more favourably upon the dilution method of disposal, and *to take advantage in point of economy* of the many intermediate procedures of this system. To apply the above reasoning to British Columbia resolves the problem into what is the actual safe "degree of dilution."

The Chicago drainage-canal, constructed under and with the approval of the Illinois State Board of Health, was established on the legal limit of 3⅓ cubic feet of river-water per second to dilute the sewage of each 1,000 persons connected with the sewers. This limit has been criticized and was probably too low for the crude sewage of a city which has such a large proportion of manufacturing wastes in its sewage-flow as is the case of Chicago. For a city without such wastes it might be termed a fair limit. Generally speaking, without prior treatment a dilution of 4 cubic feet per second per 1,000 persons is a reasonably close figure for crude sewage, although undoubtedly there are many local factors which have a bearing on the complete dilution and may be said to establish a range as wide as from 3 to 7 C.F.S.

Such simple pre-treatment devices as "screens" and "sedimentation-tanks" in certain cases (other conditions being equal) may reduce the standard to 2.5 C.F.S. per 1,000 persons. One very large factor in reducing the standard, in so far as the majority of our large streams are concerned, is: "Owing to the rivers having their feeders come from high altitudes, many of which are glacial-fed, the water is the year round very cold, therefore strikingly unfavourable to all biological activities of bacteria, worms, and other organisms which operate to decompose, digest, or oxidize the organic and mineral matters in sewage."

Fish Requirements.

Data are somewhat meagre as to the amount of dissolved atmospheric oxygen which is required in streams to protect major fish-life. In the lower Elbe near Hamburg it is stated that a margin of dissolved oxygen during the ordinary summer periods falls as low as 20 per cent., and the figure in the lower Thames is understood to be about 30 per cent.

FUTURE REQUIREMENTS.

While a firm believer in the dilution method of sewage-disposal within controlled limits as roughly outlined above, it is the part of wisdom to only approve such designs for sewer systems, so that if filtration, screening, or other pre-treatments are not needed at the outset, they can be adopted as conveniently as possible in later years, without involving pumping-stations or the abandonment at too great sacrifice in works already undertaken. In the initial stages of the development of the Province this feature should have full consideration. The writer has been in touch with many cases in England where, through the recasting of the regulations by the Royal Commission, authorities or municipalities had to face problems which involved the loss of present works, or resort to expensive pumping in order to obtain the fall necessary to install additional treatment-works for securing an effluent equal to the new standard set by the Commission. Therefore, from what has been said, it will be seen that the consensus of expert opinion based on present knowledge has aimed at the conclusion, "*That it is proposed now to take full reasonable advantage of dilution*" and to safeguard the future by so arranging the works that a more complete treatment and higher standard of effluent may be secured when and as required.

It must not be understood from the preceding remarks that sewage is the only contributory factor in the pollution of our streams. I venture to tell you that in 99 per cent. of our pre-emptions that have streams running through them the farmer has erected his buildings to include the stream in his barnyard, and in scores of cases under my observation the pigsty, corrals, and manure-piles are actually on the creek. The farmer is not to blame for this state of affairs. As usual, you find him built on the lines of least resistance, inasmuch as his stock can secure all the water they require with little attention. You have in sections 42, 43, 44, and 47 of the new Sanitary Regulations all the authority you need in handling these cases.

Have you also thought of manufacturers' trade refuse, sawmills, lead, zinc, and copper mines or refineries, all of which come under this head and require attention? It will take a number of years to round out each district, because it will be necessary to quietly accumulate data or sanitary survey of the streams, in order to be able to deal with existing pollutions, and when this is accomplished it will only be a matter of keeping in touch with proposed developments.

The Board in the near future will have to set up a standard of effluent from sewage-works, which they will allow to be discharged into the streams, and at the same time provide means of inspection to see that such standards are lived up to. In this connection I would suggest closer co-operation between the officials of other departments and the Health Department. For instance, there are Engineers in the Public Works and Water Rights Branches, Fire and Game Wardens, Pre-emption Inspectors, Assessors, policemen, etc., all of whom are travelling round the country, who could easily report on stream-pollution, providing they are circularized as to what to look out for and given a simple standard post-card report form to fill out.

DISPOSAL OF LIQUID AND SOLID DOMESTIC REFUSE IN RURAL AREAS.

I know of no other phase of rural sanitation that directly affects the health of the population more than the one just named, nor one that is capable of creating more dissatisfaction if badly administered. It is a subject on which great difference of opinion exists, even amongst those who are supposed to know. Therefore, a few suggestions on which a future meeting could be called may not be out of place.

The new regulations, sections 59 to 63, will serve as a guide only to your actions in this matter, and I earnestly desire to prevail upon you to "go slow" until the time arrives that each one of you perfectly understands the policy of the Department. I very much doubt my ability to focus the true position on this subject, and therefore ask your indulgence if the salient features are not made quite clear. The majority of experts in sanitation have accepted the following as a guide:—

(1.) In towns and populous places, where sewers and public water service are available, the use of dry closets of any kind is inadvisable, on grounds of both health and economy.

(2.) In sparsely populated rural localities, where sewers and public water service do not exist, the use of dry closets of improved kind (preferably those in which dry

earth is used) is generally to be preferred to that of water-closets, especially for the smaller houses. In such places the closet can be placed at a sufficient distance from the house not to cause a nuisance if neglected, and the contents can be disposed of on the land.

(3.) The intermediate case of a rural parish or urban district containing a closely built village, or built-up areas adjoining cities but not under city administration, with the balance of the district partly agricultural or mountainous, is often difficult to deal with in the absence of sewers or water-supply, as many houses may have little or no space for the proper placing of a closet or septic tank and the disposal of their contents, although the *majority of houses* may have sufficient space for these purposes. In the circumstances, there is usually strong local opposition to the provision of water-supply, sewers, or public scavenging, since I believe, in the present state of the law, the cost of such works has to be spread or levied over the whole contributory district and paid for by ratepayers who receive no direct benefit from them.

It would assuredly help the rural sanitary problem if it were possible to assess portions of a district *pro rata* according to benefits received.

The introduction of a public water service in a village without sewers undoubtedly aggravates sewage nuisances by increasing the volume of waste water. Also, the connecting of house-drains, especially if conveying water-closet contents, to highway drains not constructed or suited for conveying sewage is a source of nuisance and pollution of streams. The Board seem to have pinned their faith to the septic tank with surface or subsoil irrigation, and there is little doubt of this procedure making good in the majority of cases. But, at the same time, I doubt the expediency of such a method with a well on the same lot or even on adjoining lots. Again, this method would fall down completely on a clay soil and ultimately become a great nuisance. Therefore, enough has been said to show that the best regulations it is possible to frame have little or no finality in them, and, if enforced, would work a hardship on some one. It would almost seem that each case is a law unto itself, calling for the resolving of a few practical points, and even with the greatest scope given you, cases will arise that will be beyond satisfactory economical solution.

While on the subject of methods in dealing with human excrement and waste, I cannot impress upon you too strongly: "That whatever system is evolved, you cannot allow excreta or stable manure to be exposed to the atmosphere in the vicinity of dwellings, because of the breeding of flies." The ordinary house-fly is one of the most active agents known to modern sanitary science as a conveyer of the germs of disease. Many of you will no doubt recall and have personally watched how the rising curve of the summer death-rate follows the curves of flies and heat. Case after case under your own observation has proved the relationship of the fly to the toll from this seasonal prevalence of intestinal diseases, typhoid, dysentery, and the fatal summer diarrhœas of infancy. But I find myself travelling on thin ice, since this is more in your sphere of work. However, notwithstanding, we have an urgent need of stimulating and strengthening at home our machinery for the conservation of the public health, and especially is this true at this time of those activities concerned with the protection of infant and child life. In this regard, I recommend for your perusal the *Delineator* for September, in which appears a cleverly inspired article entitled "Save the Seventh Baby, or How the Fly Kills Him," by C. E. Terry, M.D. A "swat-the-fly" campaign inadequately serves the purpose and has no bearing on the root cause of the evil. Let us eliminate exposed excreta and manure-piles, which are the breeding-grounds of flies, and you have in that one action eliminated 95 per cent. of the fly problem. Statistics in the United States go to show that between 60 and 70 per cent. of infantile mortality can be directly attributed to the fly in his capacity of germ-carrier; also, the birth-rate of the different warring nations is estimated to be from 30 to 50 per cent. of normal times.

I respectfully suggest that we make an attempt to enlist the sympathy and help of all the women's organizations in British Columbia. To this as well as other phases of preventive medicine, for once you have the ladies convinced, I know of no other factor in our social or economic life that is half so powerful.

HOUSE PLUMBING.

All cities of any importance in the Province have plumbing by-laws, but how many take the trouble to see that they are effectively carried out, and why? Because it costs money to have this done. In consequence, the only safeguard against sewer-gas being admitted into dwellings is at the mercy of the plumber, who usually secures his work on competitive bids, and who is usually more interested in the few dollars he can make (often at the expense of the work) than in the matter of the public health. You will certainly do a good thing by urging the cities in your areas to have all plumber's work inspected and made to pass a water-pressure test. Cases have come to my attention where soil-pipes (which, under the present system of house plumbing, ventilate the sewers) finish through the roof below the upper-story windows. Also, the joints in same above the water-line are usually carelessly made. Again, what protection is there in this system against the housewife cleaning out the toilet and wash-basin traps and leaving them unsealed, in complete ignorance that by so doing sewer-gas is admitted to the dwelling? Or take, for instance, houses that are empty, or even temporarily empty for about three months, during a hot, dry spell such as the one we have lately experienced, and you will find the water in all the traps to sinks, wash-basins, and toilets evaporated below the sealing-point, thereby ventilating the sewers into a closed house, all the furniture and hangings, in many cases, becoming simply saturated with sewer-gas.

There is no doubt in my mind that the single-trap system, as is the practice in British Columbia, is not the best one to adopt. It may be the least expensive, but surely this is not all. In its place I suggest the double-trap system, or what is termed the intercepting trap, with manhole. This has been statutory law in England for many years, and has to its credit not only the prevention of sewer-gas to dwellings, but it also gives access by inspection to the drains, enabling the location of stoppages and the clearing of same by rodding.

The time has arrived in certain towns in the Province when, in letting or selling a house, a Sanitary Inspector's certificate as to its habitable and sanitary condition should be just as much an essential as the clear title.

Gentlemen, I am afraid that this paper is getting too long, and it has not been possible to touch on the subjects of water-supply, contamination of wells, scavenging, dust-removal, public bathing-pools, recreation-grounds, building by-laws, etc., all of which fill an important place in the chain of a sanitary regime. However, it is impossible to recount here all the detailed functions of sanitary reform. Suffice it to say at this time: "We have gained accurate knowledge of the nature of many diseases and the modes in which they are spread—a knowledge based on observation and statistical research. It remains then for those who have that knowledge to awaken and educate the public opinion to the importance of hygienic requirements. The State has realized its responsibilities and we have a sound body of sanitary legislation, not perfect indeed, but comprehensive and workable; we have central and local boards responsible for the due carrying-out of the law, and in every district in the Province we have a qualified Medical Officer of Health charged with the sanitary welfare of his community. In short, the Province has taken medicine into its service, and availed itself in a small measure of expert advice on sanitary engineering."

Finally, to summarize, we want co-operation and a higher standard of efficiency in the administration of public-health laws:—

First: In improved camp conditions.

Second: Prevention of pollution of our streams.

Third: Better disposal of our liquid and solid domestic refuse in rural areas.

Fourth: Regulations to dispose of the fly problem.

Fifth: Enforcement of the laws in regard to securing better house plumbing.

Sixth: The people of this Province are looking to you to guide them, and your responsibility cannot be side-tracked.

Seventh: I look forward to the time in the very near future when the Province will be divided into administrative public-health districts, with a full time Medical Health Officer in charge, who will act under and be responsible to the central board in Victoria.

I realize that I may have aroused in some of you resentment, inasmuch as the suggestions contained in this paper call for guidance in duties of an engineering character. As stated at

the beginning, this guidance should be forthcoming from headquarters, and I have no doubt it will be if you send along your troubles. I also have to suggest that every Medical Health Officer in the Province be provided with a copy of Dr. Poore's book on "Rural Hygiene," which is one of the best books I have perused on this subject.

I now leave you with a plea to make the year 1918 and successive years banner years in the reduction of our death-rate, which can be realized only by steady, painstaking effort. Personally, you have my sympathy, and again repeat: "It is up to you."

Discussion on Mr. Biker's Paper.

The Chairman: The discussion will be opened by Mr. Dalzell, City Engineer.

Mr. Dalzell: Mr. Chairman, Ladies and Gentlemen,—I presume that the hour is so late that the discussion will be very limited, so I will try to be very brief. I congratulate the reader of the paper on the excellent way in which he has presented this subject. There are a great number of civil engineers in the Province—or were. I might say that I understand that a third of them are on active service; but the civil engineers who practise in this Province have not, many of them, been trained or had much experience in sanitary work, and of those whose training has been in the older countries, it seems to me remarkable that so little advantage has been taken of experience of that kind in the older countries, and that you are beginning here where England and Scotland began years and years ago in many of your regulations. For instance, the Bell trap has been absolutely prohibited in the Old Country for years. It is a commercial output here and in common use. Dwellings in basements are prohibited, and where they exist in the Old Country they are regulated; but here in your new apartment-houses you make the regulation that there shall be no suites in the basement except the janitor's. Why the poor janitor should be put into the basement, when he surely requires greater protection than any other person in the building from the dust and from the chance of getting tuberculosis—but there are in this city modern apartment-houses which in that respect, in the accommodation for the janitors and in certain sanitation in the basements, would not be tolerated in any ordinary town in the older countries, and a great deal I think must be done, as the reader of the paper has said. We have to depend upon you as Medical Officers, and the medical profession especially, to do the educational work. As I said, the engineers who are responsible for a great deal of work that is carried out have not, many of them, been trained in sanitary work, and they are not heard or attended to as a medical would be. Take one instance, in one ward in this city: A fourth of that area is a muskeg swamp. Now, it is absolutely impossible that that ground will ever be fit for human dwellings to be put on, as we regard it in modern sanitation, but yet is has been permitted, and I can only imagine that this was because the surveyor who surveyed that ground in the first place had no idea of the sanitary significance of land of that description. But I do think this: I am optimistic in this respect, that I believe Canada is going to see in a very few years a tremendous influx of population, and that it is up to us, and up to the medical profession especially, to so try to provide legislation that some of the mistakes that have been made in this city in the last ten years shall not be repeated. If, for instance, we find in a city like this dwellings situated in a place which is unfit for human residences, why should we allow another city to take up the same land? And yet I take it that is what has happened at Prince Rupert. I am told that half the area of Prince Rupert is muskeg, and I don't think that any ground of that description is fit ground for human dwellings to be erected on. I could give reasons for it, because I have had a little experience in this city in that respect; but it is these points that we want the medical men to impress, to prepare for the next influx of population into this Province, which I feel is sure to come very soon, and it will come very rapidly. We want to avoid the mistakes which the older countries have made, and try to so learn, so prepare, that it won't cost us thousands or possibly millions of dollars to remedy the mistakes which, by taking the observation and experience of other countries, we might avoid.

I congratulate the writer on his paper and am glad that he is a member of the Provincial staff. I am sure, if we have more men of that description, many of these mistakes that I deplore, and that I think will be costly in the future, will be avoided. I thank you. (Applause.)

(At this point Dr. Wrinch occupied the chair.)

The Chairman: Ladies and Gentlemen,—Even at this late hour I want your indulgence while I call your attention to some points in the paper. I might say that while the writer of the previous paper was complimented on having an optimistic view-point, I would hardly be able

to compliment the writer of the present paper on having an optimistic view-point; but I am not one who has much experience in relation to mining camps; in fact, I never knew anything about mining, except what I saw in the papers, until I came to the Province some years ago, but since coming to the Province, in the northern part a mining district has been opened up. I don't know whether I heard the right definition of a mine the other day, but it was rather precise and pointed—a hole in the ground and a liar on top. Of course, I wouldn't say that all of our mines are of that nature. I want to say that while the mines in the Kootenay and Boundary Districts may be such as the writer of the paper describes, the only two mines that I know of that are mining—beginning to operate in any kind of permanent form—the camps are not in the shape he has described. I would not like it to go forth from this meeting that our mines are all of that description, or the camps are all of that description that have been stated here. I have in mind one mine that I went to visit. There they were supplied with bunk-rooms which were furnished with single-beds, iron frames; the bunk-houses have shower-baths and hot and cold water, and I have seen the miners come right from the work and go to the bath-houses, take their shower and go back to their room; and it is most convenient and appropriate. They have ventilation in the rooms in the mines—these two mines—and the camps and bunk-houses are ventilated, and certain of them are fumigated; water is piped into their building. The closet—at least, one of them—is made of a large box receptacle for a number of houses. At certain times, frequently, that box is hauled out and burned and a new one put in its place. That is only just another view-point, another feature which I would like to show, if there is any question about it, that there is that kind besides the other one.

(Dr. Underhill then took the chair.)

The Chairman: Any further discussion on this paper? I will call on Mr. Biker to reply.

Mr. Biker: It is so late, and I feel that we have had a rather long session this afternoon, so that I don't want to discuss any point at length. I did not intend to put forward that I condemned all the mining camps. That was far from my view-point. The point I tried to put forth was to have better camping-ground and better conditions for living in our camps than we have in the majority of cases. Thank you very much.

The Chairman: The next paper is "Vital Statistics," by Mr. Miller, Deputy Registrar of Births, Deaths, and Marriages, Victoria, B.C.

VITAL STATISTICS.

By Munroe Miller, Deputy Registrar of Births, Deaths, and Marriages, British Columbia.

Mr. Chairman,—A few days since I was directed by the Secretary of the Board of Health, H. E. Young, Esq., M.D., to prepare a paper or report on the "Vital Statistics of British Columbia," to be read on this occasion before the Medical Health Officers of our Province.

Not being a professional man, simply one of the staff in a department in which all members of the medical profession should take a deep interest, allow me to make the assertion that the direction "to prepare" has been obeyed; yet, let it be granted that when it comes to my turn to "read," and I find myself surrounded by the very foremost men and women of our commonwealth (actual participants in and contributors to the success of the meeting), a still small voice admonishes me, "You are in the company of distinguished strangers." Immediately self-reliance vanishes, and the position of that great factor of success, when fortified by a familiarity with the subject, is succeeded by one of extreme diffidence.

The task assigned me being statistical may, to many, prove dull and anything but entertaining, particularly at this stage of our proceedings when many are tired, yet, when presented almost as a critique by one who is not given to speaking "smooth things," it may be possible to so arouse the combativeness of hearers as to secure at least trifling attention.

The Vital Statistics Department of British Columbia has control of returns and registrations of all births, deaths, and marriages happening within our Province. The figures to be presented cover the first six months of the year 1917, and will be dealt with in order of births, deaths, and marriages.

The returns of births come under two separate headings, delayed and current, which by our system of indexing is made perfectly plain. For the purpose of showing how necessary and

important a thing it is to have prompt registration, figures for each year, from 1913 to June, 1917, will be cited:—

1913, registrations	11,088,	of which	9,199	were current.
1914, „	10,418,	„	8,754	„
1915, „	10,516,	„	8,558	„
1916, „	9,839,	„	7,475	„
1917, „	4,798,	„	3,889	„
Total	46,659,	„	37,875	„

A difference in four years and a half between delayed and current of 8,784.

Permit me here to make an explanation, and at the same time lodge a complaint against members of the medical profession—under our Act the parent shall within sixty days register the birth of a child. Many are perfectly ignorant of the law and have the idea that registration is effected by the doctor, and so suffer the matter to go by default.

By section 15 of the Act the doctor is required to notify the District Registrar of the district in which the event took place of the birth of a child to John Brown and (maiden name of mother) Susan Smith. This, however, is *not* registration.

Here is the ground of complaint: The doctors *do not make the reports* and the Department is in perfect ignorance of many births that may have taken place.

Now, to show the bearing: Every ninety days the notices of births received are compared with the registrations effected, checked, and delinquent parents are, by mail, provided with a blank form, and requested to register the birth and save themselves the penalties provided by the Act. This plan is followed by all Registrars in the Province.

Allowances must be made for people who leave the country, etc., and who cannot be located. Let us allow 5 per cent.; 8,784 who are not registered, less 5 per cent., leaves 8,345. Let us be liberal; at least 8,000 of the births have never been reported by the doctors, and of which events the Department had no knowledge whatever—a very palpable offence, or clear case of absent-mindedness, neither of which can be condoned. To show, in order to explain: Where we have had notice from physicians, and where the people have moved away, by mailing notices and forms we have had registrations effected from all portions of the United Kingdom, France, various Provinces of the Dominion, and nearly all the leading cities of the United States. Had notices never been given, registration would have been lost.

Registration of births may be by some considered a matter of trifling importance, but any sudden or violent activity in the real-estate market or winding-up of estates, such as we have lately passed through, where validity of titles were affected by lack of registration, has had an awakening effect; but when we add to that the demand for certificates of registration occasioned by the present war, in order that women and children may be enabled to establish their identity before being able to secure their allowances, then the result is, truly, brought forcibly home.

The Department must have the co-operation of the physicians. They must give notice of every birth, whether premature, still-born, or congenitally deformed so as to prevent living, and the Department must be held responsible for the registration of births by enforcing the provisions of the Act against all offenders.

As nearly as possible, following are returns of births for the different localities specified for the first six months of the year:—

Victoria	514
Nanaimo	258
New Westminster	469
Alberni	151
Beaton to Nelson	237
New Denver to Wilmer	192
Ashcroft	76
Fairview	399
Vancouver City	1,124
South Vancouver	237
North Vancouver City	58
North Vancouver District	18

Point Grey	47
Richmond	71
West Vancouver	3
Unorganized	35
Total	3,889

The total includes premature and still-born.

Re Death Returns.—Total number of deaths, 2,088, including still-births. Of this number, including still-births, under one year were 383, being 9.84 of all births and 98.48 per 1,000 of births. Deaths, up to five years, including still-births, 485, being 23.22 of all deaths and 232.27 per 1,000 of deaths. Almost one-quarter of all deaths are under five years of age.

A pertinent question is, What makes the rate so high? We enjoy, almost, immunity from diseases of the digestive system peculiar to children, there being only eleven deaths reported from summer complaints. The answer can be found in deaths of children under one year of age under the following headings:—

Congenital malformations	33
Congenital debility, icterus, and sclerema	22
Premature	49
Still-born	84
Total	188

Nine per cent. of all deaths and 38.85 per cent. of all classed under infantile mortality.

The three principal divisions, Vancouver, Victoria, and New Westminster, are responsible for:—

75 out of	84 still-births.
196 „	299 under one year.
271 „	383

The figures show that 70.75 of deaths under one year occur in the congested centres. Why should it be so? The Health Boards are untiring in their efforts to better sanitary conditions and put forth every effort to make life worth living; but there is a subtle something abroad which thwarts their efforts. Plainly, is the pace at which we travel in cities so fast that the virility of parents becomes undermined to such an extent that they are rendered physically unfit to become fathers and mothers, or has a natural life been abandoned for a scientific one, thus making a class the legend on whose banner *does not* read "Be ye fruitful, multiply, and replenish the earth"?

Is the time ripe for changing our school curriculum? Shall we teach the coming generation, as far as we are able, what life is, and that nature not only provides, but inflicts a penalty on all who violate physical laws? Or shall we make it a law of the land that all persons shall, by examination, prove their fitness to enter into the holy bonds of matrimony? Perhaps too much time has been given to this particular line of vital statistics, but all foundations must be well and truly laid.

By way of finale *re* infant mortality, allow me to interpolate; in round numbers, registered and unregistered, we have lost 500 children under five years during the first six months of the year.

Let us be sordid enough to view this matter from a financial angle, for, after all, it does seem that he makes the best argument who can show that his plan will result in a handsome credit balance. Let us consider the children a source of natural wealth. It is asserted that every child born represents a value to the State of $1,000. At the rate we are moving our annual loss in this one source of natural wealth is close upon $1,000,000.

Why not give the whole matter a business turn and endeavour to save one-half the loss by providing funds with which to secure proper supervision and institutions for treatment of children? I do not mean to deprive parents of their little ones, but to provide inspection, etc. A little further—save one-quarter of what is now a complete loss, and we have an annual gain of $250,000 in one source of natural wealth.

I have been impelled to these remarks by reading the estimates of revenue and expenditure of our Province for the year ending June 30th, 1918. Therein I find every source of natural

wealth carefully guarded by officials provided by the Government. Even wild game is capitalized at $700,000—that amount at 6 per cent. will yield $42,000 per annum; and the Game Wardens' Department costs $41,300 to maintain, the chief end and aim of the whole branch being to gratify man's lust for the destruction of helpless creatures, so that he may be amused, gratified, and provided exercise.

If there be any analogy between preservation of wild game and the conservation of infant-life, why should we not ask for the sum of $15,000 per annum from the Government for the purpose pointed out? The subject is worthy of more elaboration than time and this occasion will permit at my hands, but the hope is indulged that members of the medical profession will deem it worthy of consideration. Here is a fulcrum—provide the lever. In the end, if successful, untold numbers will rise up and call you blessed.

If our fair Province is to remain for ever the personification of "Sleepy Hollow," perhaps we should be content and still hug the delusion that "whatever is, is right"; but the world is moving, other countries are making gigantic strides for the betterment of child-life, and we must keep abreast, or expect reproach.

I have here a tabulated statement which shows the number of deaths in each division as well as the age (approximately) at death, together with the percentages of all deaths belonging to each particular age. Should any one feel interested the document is at hand for inspection.

In the beginning of this paper the co-operation of physicians was asked. It seems to me that no better place could be chosen than this to bring home my reasons. In returns of deaths the following immediate causes have been assigned:—

Hæmorrhage of Lungs.—Man was shot. A case of homicide.

Hæmorrhage and Shock.—Man's skull and legs fractured by rolling log in lumber camp.

Paralysis of Respiratory Organs and Heart-failure.—The cause was undoubtedly quite sufficient, but under what heading shall it be classed?

Fracture of Base of Skull.—How did it happen?

Bronchitis.—Respiratory failure. One, actually, *want of breath.*

Convulsions of Infants.—Twenty-four deaths. Cause of convulsions not explained. In one case return reads "Convulsions following measles." Under diseases of the respiratory system ninety-five deaths were returned, of which seventy-eight were reported under various forms of pneumonia without specifying what induced immediate cause of death.

Induced Abortion.—It is not explained whether it was the last resort of the physician to save the patient's life, or whether the patient was endeavouring to save her reputation, and as a last expedient called in the physician to save her life. Immediate cause should be explicit and nothing left to conjecture.

In short, not to particularize, the immediate causes of death assigned are, in many cases, made in such a careless manner that a compiler of tabulated statements is frequently compelled to throw up his hands in despair. Let us pass on.

Deaths from Cancer (All Forms).—This disease is on the increase. One can hardly say rapidly, yet so surely as to merit serious consideration. For instance, for the first six months of the year we have had 132 deaths resulting from cancer, seventy-five males and fifty-seven females. On looking back it is found that deaths from cancer stand in this light: 1914, 195; 1915, 221; 1916, 259; 1917 (first six months), 132, being 6.32 of all deaths, and rate of 0.34 per 1,000 population.

Tuberculosis.—In considering this disease, it may be well to consider it for a series of years, showing deaths and population for each year from 1906.

	Estimated Population 1,000 in Even Numbers.	Deaths from Tuberculosis.
1906	283,000	178
1907	304,000	243
1908	325,000	180
1909	346,000	137
1910	367,000	172
1911	392,000	316
1912	432,000	368

	Estimated Population 1,000 in Even Numbers.	Deaths from Tuberculosis.
1913	492,000	422
1914	495,000	403
1915	395,000	425
1916	383,000	367
1917	383,000 (6 months)	220

For comparison: The year 1911 has a nearer estimated population (392,000) to 1917 (383,000) than any other; still, the population of 1911 was greater than 1917 by 9,000, yet we will use the figures as they are. In 1911 there were 316 deaths from tuberculosis, or 0.80 per 1,000. For the first six months of 1917 (population estimated at 383,000) there were 220 deaths, or a rate per 1,000 of 0.57. If we for a moment compare 0.80 for twelve months (1911) and 0.57 for the first six months of 1917, the increase stands out prominently.

Now for detail; for the first six months of the year. Tuberculosis pays no respect to age, and its victims may be found from the cradle to those who have exceeded the allotted span. To illustrate: Our present returns show 6 under 1 year; 8, 1 to 2 years; 7, 2 to 5 years; 21 infantile, or 9.50 per cent. of all deaths from tuberculosis. The remainder—199—comprise all ages from 5 to 79, plus 1, age not given; 90.45 per cent. of deaths from tuberculosis, and taken as a whole—220—show 10.53 per cent. of all deaths. Further: 23.63 per cent. of deaths from tuberculosis occurred among Orientals.

It is found that the nativity of decedents total up as follows: British Columbia, 35; Orientals, 52; Italians, 6; U.S.A., 6; Germany and Austria, 5; other Provinces of the Dominion, 37; Norway and Sweden, 7; Great Britain, 42; various countries, 30; total, 220. Of the total, 185 were born outside the Province, and of those born outside 139 had resided in British Columbia for a period exceeding three years. The document containing this information is ready for inspection.

In returns of marriages we have from various offices in the Province the following:—

Alberni	54
Beaton	125
Ashcroft	26
Fairview	120
Vancouver City	560
North Vancouver City	18
North Vancouver District	3
Point Grey	22
Richmond	1
South Vancouver	47
West Vancouver	3
New Westminster City	70
Burnaby	9
Chilliwack	8
New Westminster (outside)	36
Nanaimo	27
Alert Bay	1
Comox	12
Ladysmith	5
Victoria City	180
Oak Bay	11
Esquimalt	8
Saanich	14
Cowichan	8

Showing a total of 1,368 for six months, as compared with 3,169 for the whole of last year—a falling-off at the rate of 443 per annum.

Discussion on Mr. Miller's Paper.

The Chairman: We have heard this excellent paper. Any one wishing to discuss it, we will be very glad to hear their remarks.

Dr. Price: Mr. Chairman, Ladies and Gentlemen,—It affords me great pleasure to congratulate Mr. Munroe Miller on his remarkable and excellent paper on this subject, and especially for the way in which he treated a subject in which I am very much interested; that is, the infantile birth-rate, especially the cause, the prenatal causes, of still-births, of malformation, and of premature birth. These are all, as you know, registrable in this Province. In England, in Ireland, we never register still-births. I think that is a mistake. I think we are doing the right thing in this Province to bring these to the notice of the Registration Department, but Mr. Miller put it in words, well-chosen words which no one can use better, explaining—it is a very difficult subject to touch upon—these prenatal causes of infant mortality. And I think this is a subject which requires a very great deal of attention. The idea is prevalent in families that families should not be more than a certain number, and, unfortunately, I know of many cases where there is one child, and the second one is an accident, and there was never a third. Now, in the present state of this country, where every man is wanted—and every girl baby is wanted, too—it is a crime, a crime which is unspeakable, that these things should happen.

I am speaking from experience. I come from a country—Ireland—where it is part of the religion of that country that babies should be born into the world; it is part of their religion. In that country I practised for many years; I do not recollect a still-born child in my place, and I have seen hundreds of babies into this world. True, there were instances of premature births, but the number in that country was so small in comparison to British Columbia that the only way I could account for it was that the religion of the people of the country had something to do with the full-time birth of the child. It is a very difficult subject to speak of, but Mr. Miller has put it so well and so clearly that I really need add no more to it, but to congratulate him on the way he put it. But infant mortality is, counting still-birth, counting these other causes, appalling in British Columbia; but it is no more than other countries, when we count natural deaths among infants. I do not think the rate is any more in this country than any other. Real infant mortality of children is not very great. Now I leave that subject, and condole with Mr. Miller upon the careless way in which we medical men—I take the fault to myself—fill up these death certificates.

I have the pleasure of calling upon Mr. Miller regularly once a month, and I wish here to express my appreciation of the courtesy with which he always receives me and the wonderful way in which he always has statistics ready, and which at any moment I can get from him, because I report monthly in Victoria the vital statistics of the city. Well, I can't help saying that our death certificates are filled up in a most careless way, and it is certainly annoying to him and very trying to him to have them filled up in this way; and I would suggest taking up his suggestion that medical men, both practitioners and others, should be more careful in the filling-in of the cause of death in these certificates. True, I think the certificate is wrongly drawn up. There are three small lines, a space at the bottom of the certificate; one, primary cause; and then, was an operation performed, and then the immediate cause. In case of some diseases I do not fill up the two lines. If it is tuberculosis, I simply put tuberculosis down; I do not fill up, as some people do, neurasthenia, or stoppage of breath, or something like that. That is unnecessary. We simply fill in the primary cause. I think there is room for discussion on that; there is room for improvement in the form of the death certificate, and I think that is a question that should be taken up by a meeting of the statistical officers to alter that certificate. I believe strongly in collecting the statistics of the country correctly.

Now as regards cancer: I am taking rather a special interest in the number of deaths from cancer which have recently occurred in this country, and I think, from what I gather from statistics, that cancer is running a very close race with tuberculosis, and it is a neck-and-neck race, and I think that we are not studying nearly sufficiently the subject of cancer in its many forms. We are doing good work for tuberculosis, but we are to do that work and we are not to leave the other work undone; and I think there is quite a lot to be done in the study of cancer. It is extraordinary how very prevalent it is becoming.

Now, again, about the number of tuberculosis cases, and the reference made to the fewness of cases in Great Britain: Well, I know, having lived in Great Britain, that we are dumping our cases out in this country, and great care should be taken in the examination for the admission

of people into this country. I know when I came I was put into a queue with a lot of others, and I was not very strong at the time, and my wife and children were passed by. Oh, they are all right, no examination whatever of any kind. Well, I know to a certainty within the last fortnight a man who came from England in an advanced state of tuberculosis. How he got through—well, it has been carelessness on the part of the examining officer. I think that is a matter which ought to be taken up. We really do not want British Columbia to be a dumping-place for consumptives. I think that is all I have to say, except to congratulate Mr. Miller on the excellence of his paper. (Applause.)

The Chairman: Are there any others who wish to make remarks? If you will permit me to speak from the chair, as time is getting late. I want to congratulate Mr. Miller on many of the things he has spoken of. I very much regret that there is not a larger attendance of the medical men here, because he is speaking words of wisdom on a matter that is most interesting to Medical Health Officers—that of vital statistics.

One point particularly attracted my attention; that is the large number of still-births occurring here. In 1916, for instance, there were 119 in the City of Vancouver. I feel certain, however, that a great many cases of still-births occur throughout the Province that are not reported. My early experience in this particular city of ours was that many of the still-born were buried in the back yards, one reason for that being that the funeral expenses would be too great. This matter was taken up, and we arranged that for a nominal fee of $1, on the production of a doctor's certificate, the burial would be taken care of at the cemetery. Since then we have had far more notified to the Department.

I regret that births are not notified as they should be. It is impossible for Mr. Miller or any one else to keep the vital statistics of this Province, which are so important to ourselves at the present time, and also to future generations for comparative purposes. I regret that some machinery cannot be evolved to settle this important question, and to bring the people to realize the necessity for reporting births.

With regard to the certificates of death: I feel most strongly on this point. On the form now in use there is a list of diseases which are not supposed to be accepted by the Registrar, and yet which are constantly being certified as the cause of death by the medical men. Personally, I think that the remedy is in the hands of the Registrar himself. I have a note here of a number of these instances taken from the death certificates, such as convulsions, gastritis, asthma, heart-failure, and so on, which have apparently been accepted at the Registrar's office and no prosecution has been undertaken. I deplore this very much. The method we pursue in my department is, when such a case arises, we immediately get in touch with the medical man responsible and get from him the correct cause of death. We cannot correct the death certificate, but we can correct our vital statistics. The medical men are far and away too loose and too careless.

I quite agree with Dr. Price in his remarks regarding the form of death certificate, and would like to inform him that this matter was taken up in 1899 and on numerous occasions since by the Medical Associations of Vancouver, New Westminster, and Victoria, and they all agreed on a form. I think it is a very excellent one, but it has never been adopted. I would like to see a different form from the one at present in use. However, that is a matter we can leave in Mr. Miller's hands.

Cancer is certainly increasing. Out of a total of 1,097 deaths in 1916, there were 87 deaths from cancer in this city, and I notice from the statistics that they are increasing from year to year.

I thank Mr. Miller for what he has brought to our attention to-day. Mr. Miller will reply.

Mr. Miller: Ladies and Gentlemen,—It seems to me that I haven't anything to reply. I feel flattered at the reception I have received. As to the form and as to the mode and method adopted by Dr. Underhill, I see how there happens to be a difference between his reports and mine. I take the reports we have received. He calls in a physician for the purpose of the City of Vancouver and has him correct it the way it ought to be. When I once receive that document I dare not let it out of my hands. I cannot send it back for correction; and if I write to the physician recommending him to make a correction on the cause of death, I cannot change the original document, but I must underline in red ink that such-and-such a correction is requested and authorized. You see, the thing becomes difficult; and then, as far as the machinery of the law goes, British Columbia has always been a kind of patriarchal institution.

and had a great love of the people; under the dominion and control of the Government from October, 1872, to date, as far as I know and believe, there never has been a prosecution undertaken for violation of the registration law.

Dr. Young: Mr. Chairman, I am not going to speak in reference to the paper. This winds up the proceedings of the Convention, and I am sorry that the majority of the members are not here to allow me to express my great appreciation of the attendance and the great evidence of the interest which the members of the Convention have taken in the proceedings. I have to thank those who have very kindly prepared and read their papers here. I do not think that any of us who have attended here regret the time that it has taken. The papers have been excellent. They have been prepared by those especially interested in the subject which they have undertaken to deal with. They have presented views modern and up-to-date, and they have contained many very valuable suggestions, which I hope will be acted upon by the profession, and I know will be acted upon by the Department. It is the intention to collect all these papers, together with a report of the discussions that have taken place upon them, and to publish them in the Annual Report of the Department; but they are so good that it is my intention to print them in pamphlet form immediately (Applause), accrediting each to the author, and to add to the paper the discussion; and I hope to have the pleasure shortly to send to the authors a sufficient number for themselves, and also to distribute to the profession in general copies of the proceedings of this Convention.

I want further, Mr. Chairman, to be allowed to move a vote of thanks to yourself for the able manner in which you have presided at our meetings, and also personally to thank you for the great interest you have taken, and also the great assistance you have been to me in making this Convention a success. You have shown a great deal of interest, as I know personally, in health matters, and your activity has been a great help, especially when it is manifested in this the largest centre of population in the Province, and an incentive to the Provincial Board of Health. I have much pleasure, ladies and gentlemen, in moving a vote of thanks to Dr. Underhill for his presiding at the meeting. (Applause.)

Dr. Vrooman: Mr. Chairman, I have great pleasure in seconding Dr. Young's motion of thanks to Dr. Underhill for his able conduct of the meeting.

(Dr. Wrinch in the chair.)

The Chairman: It has been moved and seconded that a vote of thanks be tendered to Dr. Underhill for the valuable services which he has rendered on the occasion of this Convention. Now, if you are all in favour of that, will you manifest it again, please? (Applause.)

The motion was carried unanimously.

Dr. Underhill: Ladies and Gentlemen,—I thank you for the kind manner in which you have spoken. I know I have always taken a great interest in this matter of public health. Sometimes I speak rather quickly, too fast, without due consideration to the seriousness of the subjects we are discussing, but if I have occasioned any harm or inconvenience I am sorry for it. Gentlemen, I thank you very kindly for your reception of my little efforts here.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

REPORT

OF THE

MINISTER OF LANDS

FOR THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDING 31ST DECEMBER

1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

Victoria, B.C., April, 1918.

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

Herewith I beg respectfully to submit the Annual Report of my Department for the year ending December 31st, 1917.

T. D. PATTULLO,

Minister of Lands.

PART I.

DEPARTMENT OF LANDS.

Victoria, April 24th, 1918.

The Honourable T. D. Pattullo,

Minister of Lands, Victoria, B.C.

Sir,—I have the honour to submit the Annual Report of the Department of Lands for the twelve months ending December 31st, 1917.

I have the honour to be,

Sir,

Your obedient servant,

G. R. NADEN,

Deputy Minister of Lands.

DEPARTMENT OF LANDS.

REPORT OF OFFICE STATISTICS.

February 18th, 1918.

G. R. Naden, Esq.,
Deputy Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit herewith report in the form of tabulated statements covering the administration of lands in the Province during the year 1917, as follows:—

(1.) Statement showing the number of pre-emption records, certificates of improvement, and certificates of purchase issued:
(2.) Statement of Crown grants issued, divided into different classes and showing the total acreage of Crown-granted pre-emptions, mineral claims, and purchase land:
(3.) Statement of coal-prospecting licences, coal leases, and sundry leases issued, showing the approximate area thereof and the money collected in connection therewith:
(4.) Statement of land-sales, showing the area of surveyed and unsurveyed land sold:
(5.) Statement of the number of pre-emptions inspected during 1917 in the various land districts:
(6.) Statement showing the revenue received by the Lands Branch at Victoria, giving the amounts received each month:
(7.) Comparative statement of the various land transactions since the year 1905.

I have, etc.,
H. CATHCART,
Superintendent of Lands.

PRE-EMPTION RECORDS, ETC., 1917.

	Pre-emption Records.	Certificates of Improvements.	Certificates of Purchase.
Alberni	18	9	31
Ashcroft	6	1	....
Atlin	3	1	....
Clinton	120	73	52
Cranbrook	35	15	48
Duncan	....	....	....
Fairview	35	17	30
Fernie	3	6	3
Fort Fraser	117	55	52
Fort George	150	106	54
Golden	3	4	9
Hazelton	33	20	23
Kamloops	35	16	10
Kaslo	4	2	25
Nanaimo	5	1	5
Nelson	4	8	7
New Westminster	1	3	1
Nicola	44	21	13
Prince Rupert	34	40	84
Quesnel	72	92	31
Revelstoke	1	1	....
Telegraph Creek	....	....	....
Vancouver	83	40	112
Vernon	13	8	9
Victoria	5	2	179
Totals	824	541	778

CROWN GRANTS ISSUED, 1917.

Pre-emptions	463
Purchase	129
Minerals	216
Town lots	41
Reverted lands	2
Reverted minerals	55
"School Act"	6
"Soldiers' Homestead Act"	246
Miscellaneous	4
Reverted town lots	4
"Coal-mines Act"	1
Crown grants written up	1,167
Application for Crown grants	1,380
Certified copies of counterfoil	10

TOTAL ACREAGE DEEDED.

Pre-emption	78,407.08
Purchase surveyed	25,291.71
Purchase unsurveyed	103,590.04
Mineral	10,730.36
Total acreage deeded	187,111.64

REPORT ON COAL LICENCES, LEASES, ETC., 1917.

COAL-PROSPECTING LICENCES.

Number Licences issued.	Licence Fees.	Penalties.	Transfer Fees.	Area.
71	$8,000 00	$400 00	$5 00	Acres. 45,440

COAL LEASES.

Number.	Fees.	Rentals.	Total.	Area.
7	$1,897 60	$18,106 76	$20,004 36	Acres. 3,472

SUNDRY LEASES.

Number.	Fees.	Rentals.	Total.	Area.
73	$365 00	$32,180 50	$32,545 50	Acres. 6,650

LAND-SALES, 1917.

	Acres.
Surveyed lands sold	629.40
Unsurveyed lands sold	381.30
Total lands sold	1,010.70

PRE-EMPTIONS INSPECTED IN 1917.

Alberni	98
Atlin	..
Cariboo	6
Cranbrook	142
Fernie	29
Fort Fraser	1
Fort George	83
Golden	77
Hazelton	..
Kamloops	..
Lillooet	..
Nanaimo	43
Nelson	59
New Westminster	..
Nicola	26
Osoyoos	84
Revelstoke	16
Similkameen	168
Skeena	..
Slocan	22
Vancouver	237
Victoria	27
Yale	12

STATEMENT OF REVENUE.

Months.	Pre-emption Records.	Records.	Certificates of Improvements.	Crown Grants and Fees.	Survey Fees.	Rent of Land.	Search.	Coal-prospecting Licences.	Land-sales.	Miscellaneous.	Total.
January	....	....	....	$1,695 00	$1,273 35	$5,275 27	....	$200 00	$21,422 76	$306 95	$30,173 33
February	....	....	....	960 00	289 50	6,214 50	....	350 00	2,961 77	338 63	11,114 40
March	$4 00	....	$2 00	770 00	10 00	2,412 40	....	100 00	2,995 15	192 36	6,485 91
April	2 00	$4 00	....	550 00	52 50	3,881 55	....	....	4,187 55	138 40	8,821 00
May	....	....	....	1,025 00	20 00	6,013 45	....	750 00	602 65	139 80	8,550 90
June	....	2 00	....	745 00	....	4,647 98	....	600 00	1,643 94	125 99	7,764 91
July	....	2 00	....	835 00	307 50	4,927 35	....	300 00	2,606 31	522 24	9,500 40
August	4 00	....	....	1,025 00	....	1,304 15	....	900 00	25,963 40	579 60	29,776 15
September	....	....	2 00	785 00	....	4,149 35	....	....	13,605 19	967 46	19,509 00
October	....	2 00	....	1,300 00	320 00	2,960 75	....	400 00	29,902 85	400 35	35,285 95
November	....	....	....	1,530 00	....	2,154 75	....	2,700 00	6,642 36	148 11	13,175 22
December	....	4 00	....	1,325 00	117 00	6,345 76	$5 00	1,700 00	4,482 13	299 11	14,278 00
Totals	$10 00	$14 00	$4 00	$12,550 00	$2,389 85	$50,287 26	$5 00	$8,000 00	$117,016 06	$4,159 00	$194,435 17

SUMMARY.

	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Pre-emption records	955	1,048	936	1,535	1,620	2,049	2,383	3,655	3,855	4,304	2,277	1,167	824
Certificates of improv't.	189	180	262	256	289	439	624	715	962	1,002	665	465	541
Certificates of purchase.	1,637	1,550	3,205	2,438	4,363	9,031	7,141	5,065	3,640	1,805	990	729	778
Crown grants	1,064	1,124	1,520	1,667	1,714	1,572	2,566	2,757	2,110	1,376	718	847	1,167
Total acreage deeded	133,184.46	336,145.03	599,419.57	253,541.95	326,229.54	300,587.79	524,325.99	253,143.06	390,036.23	245,244.78	75,225.00	98,452	187,111.64
Coal-prospecting licences	508	286	426	479	692	145	2,223	2,003	1,090	545	198	120	71
Sundry leases	103	294	155	36	83	92	121	47	46	51	38	86	73
Coal leases	....	....	....	....	....	....	....	75	207	71	29	31	7
Cash received	$723,119 07	$1,230,754 07	$2,088,923 79	$3,065,164 43	$4,148,403 44	$3,190,416 21	$3,526,544 61	$2,525,497 29	$946,944 23	$589,687 36	$126,308 28	$159,213 65	$194,435 17
Letters received	16,609	19,661	29,430	33,629	25,798	37,188	41,946	43,302	31,738	30,287	19,151	13,779	15,780
Letters sent	....	....	....	....	....	....	23,568	21,612	17,305	14,790	10,104	8,432	12,632

PART II.

SURVEY BRANCH.

REPORT OF THE SURVEYOR-GENERAL.

The Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

Sir,—I have the honour to submit the following report on the work of the Survey Branch of the Lands Department for the year ending December 31st, 1917:—

The outstanding feature of the policy of this Branch for the year has been strict economy and the confinement of expenditures to only what was considered the most necessary work in the field. Attention was therefore concentrated to a large extent on the survey of lands already held under pre-emption record.

Under the provisions of the "Land Act" it is one of the duties of the pre-emptor who takes up unsurveyed land to have the land recorded by him surveyed at his own expense by a duly qualified British Columbia land surveyor. When, however, there are a number of such pre-emptions recorded in a more or less restricted area, it is found impracticable to allow each individual pre-emption to have a separate survey made, as such procedure invariably leads to complications which are not only a source of annoyance both to the Department and the pre-emptors, but in many cases occasion the expenditure of considerable time and money to adjust. The Department therefore endeavours to make the necessary surveys whenever a number of pre-emptions are recorded in groups, provided the settlement bears evidence of *bona fides* and is not too far removed from means of transportation. In this manner the Survey Branch assists to a large extent the general Government policy of closer settlement, in that the pre-emptor who takes up land "close in" where communities can be established and means of transportation easily provided is encouraged to the extent of having his surveys made free, while the man who settles in isolated and remote localities is required to make private arrangements for his survey at his own expense.

In the Coast districts land-settlement is only one of a number of phases of the survey situation which this Branch has to deal with. It is in these districts that the large majority of existing timber licences are located. Most of these are now surveyed, which fact facilitates the work of the Branch to a large extent. However, as these surveys were all made as private surveys, by surveyors employed and paid directly by the timber licensee, and owing to the mountainous nature of the country, combined with the extent and sinuosities of the coast-line, it has been impossible to exercise a very efficient control over the proper correlation of these numerous surveys. Owing to increased activity in the timber and pulp industries, this Branch is being called upon to clear constantly increasing numbers of applications for timber-sales and hand-logger licences. In order that proper clearances may be made, it is necessary that the maps of the Department be accurate and reliable. The Admiralty charts in the past have been used to a very large extent. As the number of alienations increase, however, it is found that the charts are not sufficiently reliable for our purposes. It has been found necessary, therefore, to have traverse connections made between various unconnected, isolated lots or groups of surveys, and a large proportion of the surveys made on the Coast during the past season was confined to work of this nature.

Arrangements are being made whereby it is hoped to have these coast-line traverses connected with the stations of the Geodetic Survey of Canada which is being projected along the Coast between the southern boundary of Alaska to the 49th parallel. In this way it will be possible to prepare maps of greater geographical accuracy than would otherwise be obtainable.

In all, twenty-one parties were employed during the year. Owing to the comparatively small appropriation available and the increased cost of labour and supplies, it was necessary to confine operations to a very short season. On account of the uncertainty of the market in ordinary supplies the ration allowance was discontinued this year and surveyors were allowed the actual cost of their supplies. The fact that the average cost per man per day was only 75 cents indicates that our surveyors as a whole have been economical in this regard.

The total number of acres of Crown land surveyed is 54,027, as compared with 128,000 acres in 1916. The total mileage of coast-line traversed is 377.

The surveys included 326 pre-emptions in good standing, and which in the majority of cases were occupied and improved more or less or were held by men absent on military duty.

The following is a summary of the field operations carried out during the past season in the five sections into which the Province has been divided for convenience of description in this report:—

CENTRAL AND NORTHERN INTERIOR.

The term "Central and Northern Interior" in this report is applied to that portion of the Province lying east of the Coast or Cascade range of mountains and north of the Dominion Government Railway Belt. The greater portion of the undeveloped agricultural areas of the Province are included in this division, which was the scene of extensive surveying operations during the period between the years 1909 to 1914, with the result that a large area of surveyed lands is now available for pre-emption, and there is no immediate necessity for any further surveying of vacant Crown lands for settlement. However, it is found that settlement does not confine itself to surveyed lands, and it becomes necessary from year to year to survey various areas where pre-emptions are located in groups on unsurveyed lands. The following surveyors were employed on work of this nature in the localities indicated:—

H. C. Black.....Vanderhoof, and Burns, Decker, and Francois Lakes.
R. W. Haggen.....Soda Creek and Alexandria.
F. Tupper.....Moffat Creek and Horsefly River.
W. S. Drewry.....Green Lake and 83-Mile Creek.
Geo. S. Boulton.....Fraser River Valley west of Pavilion.
J. E. Ross.....North Thompson River Valley.

In addition to the ordinary pre-emption surveys, Mr. Black also laid out a small townsite at Burns Lake, where a sale of lots was subsequently held.

SOUTHERN INTERIOR.

In the Southern Interior, being that portion of the Province lying south of the Dominion Railway Belt, five parties were employed, as follows:—

O. B. N. Wilkie.....Hatheume, Penask, and Stump Lakes.
A. P. Cummins.....Trinity Valley and Mabel Lake.
F. H. Latimer.....West of Okanagan Falls.
H. N. Clague.....Keremeos Creek Valley.
B. A. Moorhouse.....Vicinity of Greenwood.

Mr. Wilkie also made a retracement survey in the vicinity of Arrowhead. R. P. Brown also made a small survey for the Department in the vicinity of Incameep Creek.

MAINLAND COAST.

Six parties were employed on surveys along the Coast between Prince Rupert and Vancouver, as follows:—

H. H. Roberts.....Redonda Island.
J. E. Laverock.....Jervis Inlet.
D. J. McGugan.....Powell River and Port Harvey.
John Elliott.....Blunden Harbour and vicinity.
C. C. Smith.....Rivers Inlet.
A. E. Wright.....Porcher and Banks Islands.

A large portion of the work done by Messrs. Laverock, Elliott, and Smith consisted of shore traversing, the necessity for which has been previously referred to in this report. Mr. Wright surveyed certain lot boundaries on Porcher Island which were omitted in the original survey, and which were causing the settlers on the island considerable inconvenience.

VANCOUVER ISLAND.

Only one surveyor, L. S. Cokely, was employed on Vancouver Island, who surveyed some pre-emptions on islands adjoining the north coast of Vancouver Island and completed some necessary work in the vicinity of Quatsino.

QUEEN CHARLOTTE ISLANDS.

J. C. A. Long was employed for a short time on Queen Charlotte Islands on small scattered surveys near Masset, Tlell, and Skidegate Inlet.

TOPOGRAPHICAL SURVEY OF OKANAGAN LAKES.

The photo-topographical survey of the watershed of Okanagan Lake commenced in 1914 was completed this season. The work throughout has been in charge of R. D. McCaw, who is now engaged in the preparation of the final maps. It is proposed, as soon as possible, to have the maps of the entire area covered reproduced by lithography, in order that the information obtained may be more readily available. These maps, when completed, will represent the most accurate and comprehensive scheme of topographical surveys ever carried out by the Province, and when their utility becomes generally recognized will no doubt create a demand for surveys of a like nature in other portions of the Province.

The Department is indebted to Dr. Deville, Surveyor-General of Dominion Lands, for facilities in connection with the developing of the photographic plates and enlargements, and to J. J. MacArthur, Dominion Boundary Commissioner, for the loan of surveying cameras and instruments.

ALBERTA-BRITISH COLUMBIA BOUNDARY.

The boundary between British Columbia and Alberta follows the continental divide from the 49th parallel, or International Boundary, to the intersection of this divide with the 120th meridian of longitude, from which point it follows that meridian to the 60th degree of latitude. In 1913 a joint Commission was formed for the definition of the boundary, the arrangement being that the Dominion, Alberta, and British Columbia Governments each bear one-third of the cost. R. W. Cautley, D.L.S. and A.L.S., represents both the Dominion and Alberta, while A. O. Wheeler, B.C.L.S., is Commissioner for this Province. The work of the Commission was continued during the past season. Mr. Wheeler's report is attached hereto.

SURVEYORS' REPORTS.

As in former years, the general reports of the surveyors who have been employed during the season are submitted with this report.

PRIVATE SURVEYS.

In addition to the surveys made under the direct instructions of this office, the Branch is called upon to deal with the surveys of lands applied for in various ways for various purposes, and which, under the several Statutes affected, are surveyed at the expense of such applicants. Surveys of this nature are known departmentally as "private surveys," and include surveys of pre-emptions, applications to purchase, applications to lease, coal-prospecting licences, mineral claims, and timber licences.

There has been a marked decrease of surveys of this nature in recent years, and the past year shows a further decrease in all classes, with the exception of that of mineral claims, in which there is an increase.

An amendment to the "Forest Act" in 1917 provides for an extension of the time during which unsurveyed timber licences must be surveyed from March 31st, 1918, to November 30th, 1919; provided that the holder of any licence which is not surveyed on or before the former date shall not thereafter be entitled to include in his survey any land included in any timber limit which has been surveyed before that date.

It will be seen, therefore, that the remaining unsurveyed licences must be surveyed during the surveying seasons of 1918 and 1919. As there are still some 3,000 unsurveyed licences in good standing or renewable, there will no doubt be considerable activity in timber surveys during the next two seasons.

OFFICE-WORK.

The details of the work of the office are covered by the report of the Chief Draughtsman submitted herewith.

Under the recent reorganization of the whole Lands Department, the work of accounting, stenography, and filing has been removed from the direct supervision of this Branch and co-ordinated with similar work of the other branches of the Department, while the draughting

staffs of the Water and Forest Branches have been brought under the supervision of this Branch. As this change was consummated late in the year, it is impracticable to give any data of value with regard to the work done by the six additional members of the staff, which has been confined entirely to the service of the branches from which they were drawn. The rearrangement will tend towards greater efficiency, in that the entire draughting staff of the Department is available to be drawn upon for any emergency which may arise in any particular line of work.

Although only two draughtsmen have been available for geographic mapping-work, considerable progress has been made in connection with this work. The map of Northern British Columbia on the scale of 17.75 miles to an inch, issued during the year, is filling a long-felt want, being the first publication to show in a comprehensive way the large amount of geographic data regarding this portion of the Province, which has been obtained since the advent of the Grand Trunk Pacific Railway.

Two pre-emptors' maps—viz., the Nechako and North Thompson Sheets—have been revised and reissued. A change has been made in the method of colouring these maps. Former issues showed all lands available for pre-emption, whether surveyed or unsurveyed, in red, with the result that large areas known to be entirely unsuitable for settlement were shown to be available, thus creating a somewhat erroneous impression in the minds of persons not intimately acquainted with the country. The maps issued this year show all alienated lands coloured buff, and the remaining areas uncoloured.

GENERAL.

Although statistics show that the aggregate of both field and office work is slightly less than for the year 1916, which was also a "small" year, the indications are that the bottom of the curve has been reached and passed, and that a considerable increase in the work falling to this Branch may be looked for during the coming year.

In my report for the year 1916 it was stated that 110 British Columbia land surveyors were either in the Army or Navy for military service, and that twelve of these had been killed in action. During the past year five additional members of the profession have enlisted, and four more have been killed in active service.

I have the honour to be,
Sir,
Your obedient servant,
J. E. UMBACH,
Surveyor-General.

REPORT OF THE CHIEF DRAUGHTSMAN.

December 31st, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the work of the Survey Branch for the year ending December 31st, 1917:—

OFFICE-WORK.

The general work carried out has been similar to that done in previous years, while the volume of work handled has been about the same as that in 1916. At the present date the staff numbers twenty-four in all, which is a reduction of nearly 60 per cent. since the beginning of the war. Certain changes have been made in connection with the reorganization carried out in the Lands Department, and the majority of the staff, together with six draughtsmen from the Water and Forest Branches, are now located in the large draughting-room of the new West Wing.

FIELD-NOTES.

During the year 914 field-books were received, containing notes for 1,083 lots. During the same period 1,497 lots were plotted and gazetted. Tracings of these lots were prepared and forwarded to the Government Agents in whose districts they were located.

The following table gives an analysis of the acreages of the various kinds of surveys dealt with:—

	Acres.
Pre-emption surveys	12,632
Purchase surveys	802
Mineral-claim surveys	8,386
Timber-licence surveys	275,538
Coal-licence surveys	2,843
Lease surveys	2,960
Government surveys	111,256
Total	414,417

A comparison of these figures with those of previous years, as far back as 1900, may be found by reference to Table A attached to this report. While there has been an increase in mineral-claim surveys, it will be noted that all other surveys are slightly less than shown by the figures for 1916.

Timber Surveys.

Field-notes covering the survey of 424 licences were received during the year, as compared with 471 during 1916. It is estimated that of the timber licences in good standing, or renewable under the Statute, 10,391 have been surveyed, leaving 3,302 still unsurveyed.

Railway Plans.

During the year plans covering 73.5 miles of railway right-of-way have been finally dealt with and cleared for Crown-granting purposes.

Clearances.

As in previous years, clearance reports have been furnished by this Branch on all applications for lands dealt with by the Lands Department. These include 822 applications for pre-emptions and 19 applications to purchase. The corresponding figures for 1916 were 1,172 and 18 respectively. These applications, together with those dealt with by the Forest Branch, including nearly 500 timber-sales, are all plotted and noted on the departmental reference maps. Suitable notations are also made on these maps as to the cancellation of pre-emptions, applications to purchase, timber-sales, etc.

Reference Maps.

The work of keeping these maps up to date and compiling new ones has been proceeded with as heretofore, although not in such a large degree owing to the reduced staff. Ten maps were remade this year and seven were revised, covering an area of 36,040 square miles. The areas included within similar work for 1915 and 1916 were 46,620 and 43,425 square miles respectively.

Information supplied to Surveyors and Others.

A nominal charge is made for the preparation of copies of field-notes, blue-prints, etc., required by surveyors and others. The revenue derived from this source amounts to $1,327, as compared with $1,368.87 for 1916. This work entailed the copying of 167 sets of field-notes, 838 tracings, and 883 letters.

The following is a statement of the number of blue-prints made:—

Mail and counter orders	1,393
Government Agents	715
Surveyor-General's Branch	1,826
Forest Branch	2,798
Other branches of Government Service	3,253
Sundry	450
Total	10,435

There were also prepared 1,106 tracings (in duplicate) to be attached to Crown grants, and 81 tracings (in duplicate) to accompany land leases.

CORRESPONDENCE AND ACCOUNTS.

During the year 3,893 letters were received and 3,896 sent out, which does not include interdepartmental memoranda.

Accounts amounting to $91,664 have been checked and dealt with by the Accountant.

GENERAL.

In addition to the above, the preparation of instructions for both Government and private surveys, including the copying of information from official records, forms a considerable portion of the work of this office.

As in previous years, the staff has also been called upon to attend to various draughting-work for other departments of the Government.

GEOGRAPHIC SUB-BRANCH.

Only two draughtsmen have been available for the compilation and preparation of maps for reproduction by lithography during the past year. Three maps were published, as follows:—

No. 3B. Nechako Pre-emption Sheet; scale, 3 miles to an inch.

No. 3J. North Thompson Pre-emption Sheet; scale, 3 miles to an inch.

No. 1H. Northern British Columbia; scale, 13.75 miles to an inch.

A new map, No. 2c. of the Land Series, on the scale of four miles to an inch, covering the northern half of Vancouver Island, has occupied the greater portion of the time of the mapping staff for the year. It is now nearing completion and it is hoped to have it ready for the printer shortly.

Of the various lithograph maps available for distribution by this Department, some 15,169 were issued during the past year.

A price-list of lithograph maps and blue-prints of departmental reference maps is attached to this report.

I have, etc.,

F. O. MORRIS,

Chief Draughtsman.

APPENDIX TO REPORT OF SURVEYOR-GENERAL.

Table A.—Showing Acreages of each Class of Surveys gazetted each Year since 1900.

Year.	Pre-emptions.	Purchases.	Mineral Claims.	Timber Limits.	Coal Licences.	Leases.	B.C. Govt. Surveys.	Totals.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1900	22,873	4,419	33,441	59	....	664	10,057	71,513
1901	26,493	16,401	33,400	2,207	....	593	....	79,094
1902	35,297	29,652	31,057	1,040	626	1,026	....	98,698
1903	37,615	26,787	18,115	127,992	....	2,003	800	213,312
1904	48,124	36,468	20,549	155,279	48,670	3,009	179	312,278
1905	42,660	58,705	15,535	214,841	137,218	806	107	469,872
1906	33,573	66,668	9,894	77,829	41,312	9,566	....	238,842
1907	50,460	162,218	10,017	83,016	20,367	4,387	113,968	444,433
1908	66,788	147,980	14,607	167,925	9,821	2,580	97,072	506,773
1909	71,316	145,325	10,744	426,121	8,310	15,239	512,373	1,189,428
1910	79,273	455,356	12,499	509,201	43,363	5,864	302,536	1,407,912
1911	89,485	1,352,809	21,325	686,909	120,938	6,500	948,644	3,226,610
1912	99,461	1,011,934	16,645	804,730	99,236	8,560	826,362	2,866,997
1913	55,202	508,062	18,043	1,181,355	72,719	4,740	1,014,366	2,854,487
1914	45,551	234,580	7,546	1,105,635	36,098	4,209	1,078,579	2,512,198
1915	22,746	41,551	8,339	512,628	29,245	841	705,170	1,320,520
1916	14,335	8,771	7,677	302,903	10,983	5,145	124,953	474,767
1917	12,632	802	8,386	275,538	2,843	2,960	111,256	414,417

Table B.—Showing Proportion of Government Surveys to Total Land Surveys since 1900.

Year.	Total Surveys.	Govt. Surveys.	Proportion of Govt. Surveys to Total.
1900 to 1906	907,373	11,143	0.012
1907 to 1911	4,901,984	1,974,593	0.403
1912	2,062,267	826,362	0.401
1913	1,673,132	1,014,366	0.606
1914	1,415,186	1,078,579	0.762
1915	807,892	705,170	0.872
1916	171,864	124,953	0.727
1917	138,879	111,256	0.801

Table C.—Summary of Office-work for the Year 1917 and Comparative Figures for 1916.

	1916.	1917.
Number of field-books received	889	914
„ lots surveyed	1,538	1,083
„ lots gazetted and tracings forwarded to Government Agents	1,718	1,497
„ miles of right-of-way plans received	360	73.5
„ applications for purchase cleared	17	19
„ applications for pre-emption cleared	1,172	822
„ reference maps compiled	17	10
„ Crown-grant applications cleared	846	1,167
Total number of letters received by Branch	4,532	3,893
„ „ Crown-grant and lease tracings made in duplicate	963	1,187
„ „ blue-prints made	9,082	10,435
Total revenue from information, blue-prints, maps, etc.	$1,368.87	$1,327.00

TABLE D.—LIST OF LITHOGRAPHED MAPS.

Map No.	Year of Issue.	Title of Map.	Scale.	Per Copy.	Per Dozen.
		GEOGRAPHIC SERIES—			
1A	1912	British Columbia. In four sheets. Showing roads and trails, railway systems, etc.	17.75 m. to 1 in.	$1 00	$10 00
1B	1913	British Columbia. In one sheet. Showing Land Districts	30 m. to 1 in.	25	2 00
1C	1913	British Columbia. In one sheet. Showing Land Recording Divisions	30 m. to 1 in.	25	2 00
1D M	1913	British Columbia. In one sheet. Showing Mining Divisions (Amended 1917)	30 m. to 1 in.	25	2 00
1E R	1915	Kootenay, Osoyoos, and Similkameen. Showing Mining Divisions	7.89 m. to 1 in.	25	2 00
1E	1915	Kootenay, Osoyoos, and Similkameen. Showing Land Recording Divisions	7.89 m. to 1 in.	25	2 00
1F	1915	British Columbia. In one sheet. Showing Electoral Divisions	30 m. to 1 in.	25	2 00
1G	1916	Cariboo and Adjacent Districts. Showing Land Recording Divisions	7.89 m. to 1 in.	25	2 00
1H	1917	Northern British Columbia	17.75 m. to 1 in.	25	2 00
		LAND SERIES—			
2A	1913	Southerly Vancouver Island	4 m. to 1 in.	25	2 00
2B	1914	New Westminster and Yale Districts	4 m. to 1 in.	25	2 00
†2C	1918	Northerly Vancouver Island	4 m. to 1 in.	25	2 00
		PRE-EMPTORS' SERIES—			
3A	1916	Fort George	3 m. to 1 in.	Free	1 00
3B	1917	Nechako	3 m. to 1 in.	Free	1 00
3C	1914	Stuart Lake	3 m. to 1 in.	Free	1 00
3D	1915	Bulkley Valley	3 m. to 1 in.	Free	1 00
3E	1914	Peace River	4 m. to 1 in.	Free	1 00
3F	1915	Chilcotin	3 m. to 1 in.	Free	1 00
3G	1915	Quesnel	3 m. to 1 in.	Free	1 00
3H	1915	Tete Jaune	3 m. to 1 in.	Free	1 00
3J	1917	North Thompson	3 m. to 1 in.	Free	1 00
3K	1915	Lillooet	3 m. to 1 in.	Free	1 00
3L	1915	Graham Island, Queen Charlotte Islands	3 m. to 1 in.	Free	1 00
3M	1916	Prince Rupert	3 m. to 1 in.	Free	1 00
		DEGREE SERIES—			
*4A	1912	Rossland Sheet	2 m. to 1 in.	$0 10	..
*4B	1912	Nelson Sheet	2 m. to 1 in.	10	..
*4C	1912	Cranbrook Sheet	2 m. to 1 in.	10	..
4D	1913	Fernie Sheet	2 m. to 1 in.	10	..
4E	1913	Upper Elk River Sheet	2 m. to 1 in.	10	..
4F	1913	Duncan River Sheet	2 m. to 1 in.	10	..
4G	1914	Windermere Sheet	2 m. to 1 in.	10	..
†4H	1915	Arrowhead Sheet	2 m. to 1 in.	10	..
		TOPOGRAPHICAL SERIES—			
5A	1916	Omineca and Finlay River Basins, Sketch-map of	5 m. to 1 in.	25	2 00
		MISCELLANEOUS—			
48	1913	Sayward District, Sketch-map of	3 m. to 1 in.	10	..
33	1912	Yale District and Portion of Adjacent Districts	8 m. to 1 in.	25	2 00
27	1912	Rupert and Coast Districts, Portions of	3 m. to 1 in.	10	1 00
22	1912	Northern Interior	17.75 m. to 1 in.	10	1 00
18	1912	British Columbia, South-west Portion of. (Second iss.)	12 m. to 1 in.	25	2 00
9	1907	Northern Interior. (A. G. Morice.)	10 m. to 1 in.	10	50
7	1903	British Columbia. In two sheets	20 m. to 1 in.	..	5 00
5	1898	Kootenay District, East, Triangulation Survey of	6,000 ft. to 1 in.	10	50
4	1897	Osoyoos District, Portion of	2½ m. to 1 in.	10	50
3	1897	Kootenay District, West Division, and Part of Lillooet, Yale, etc., Mining Recording Divisions	8 m. to 1 in.	10	50
2	1896	Kootenay District, West, Portion of	1 m. to 1 in.	10	50
1	1895	Vancouver Island, West Coast, Portion of; Clayoquot District	½ m. to 1 in.	10	50

† In course of compilation. * Out of print. ‡ In course of printing.

NOTE.—To avoid misunderstanding, applicants for maps are requested to state the "Map Number" of map desired.

Table E.—Departmental Reference Maps.

Price-list of Blue-prints.

		Scale.	Price.
1.	West Coast, V.I. (Barclay Sound, Southerly)	1 inch to 1 mile	$1 00
1A.	West Coast, V.I. (Barclay Sound, Northerly)	„ „	1 00
2.	West Coast, V.I. (Nootka District)	„ „	1 00
3.	Belize and Seymour Inlets	„ „	1 00
3A.	Quatsino Sound and West Portion of Rupert District	„ „	1 00
3B.	Gilford, Cracroft, and Broughton Islands	„ „	1 00
3C.	Nimpkish River Valley and Lake	„ „	1 00
3D.	Central Portion of Rupert District	„ „	1 00
4.	Knight, Bute, and Toba Inlets	„ „	1 50
4A.	Sayward District	„ „	1 00
5.	Texada Island and West Portion of New Wesminster District	„ „	1 00
5A.	Jervis and Sechelt Inlets	„ „	1 00
5B.	Howe Sound and Cheakamus River Valley	„ „	1 00
5C.	Harrison Lake and Lillooet River Valley	„ „	1 00
5D.	Powell Lake	„ „	1 00
6A.	Nicola District	„ „	1 00
6B.	Princeton and vicinity	„ „	1 00
6C.	Ashnola and South Similkameen River Valleys	„ „	1 00
7.	North Okanagan (Osoyoos District)	„ „	1 00
7A.	South Okanagan and Kettle River Valley	„ „	1 00
7B.	Similkameen District (Keremeos, Fairview, and Greenwood)	„ „	1 00
11.	Clearwater and Murtle River Valleys	„ „	1 00
11A.	North Thompson River Valley	„ „	1 50
12.	Dean and Burke Channels and Rivers Inlet	½ inch to 1 mile	1 50
12A.	Bella Coola Valley	1 inch to 1 mile	1 50
14.	Banks and Pitt Islands and vicinity	„ „	1 00
14B.	Gardner Canal and vicinity	½ inch to 1 mile	1 00
15.	Moresby Island, Northern Portion	1 inch to 1 mile	1 00
15A.	Moresby Island, Southern Portion	½ inch to 1 mile	1 00
16.	Graham Island, North-east Portion	1 inch to 1 mile	1 00
16A.	Graham Island, South-east Portion	„ „	1 00
16B.	Graham Island, West Portion	„ „	1 00
17.	Portland Canal and Observatory Inlet	„ „	1 00
17A.	Skeena River Valley (Mosquito Creek to Kispiox River)	„ „	1 00
17B.	Nass and Kitwancool River Valleys	„ „	1 00
18A.	Tete Jaune Cache and Upper Fraser River Valley	„ „	1 00
19.	Lower Skeena and Zymoetz River Valleys	„ „	1 00
19A.	Skeena and Kitsumgallum River Valleys	„ „	1 00
19B.	Prince Rupert, Mouth of Skeena and Nass Rivers	„ „	1 00
20.	Bulkley River Valley (Hazelton to Moricetown)	„ „	1 00
21A.	Fraser Lake and Nachako Valley	„ „	1 00
21B.	Francois and Ootsa Lakes	„ „	1 00
21C.	Douglas Channel and Kildala Arm	„ „	1 00
22.	Bowron River and Upper Fraser River Valley	„ „	1 50
22A.	Fort George and vicinity	„ „	1 00
22B.	Portion of Nechako River Valley and Cluculz Lake	„ „	1 00
22C.	Blackwater and Mud River Valleys	„ „	1 00
22D.	Fraser River Valley, vicinity of Quesnel	„ „	1 00
22E.	Goat River and Upper Fraser River Valleys	„ „	1 00
23.	Quesnel Lake (East Arm)	½ inch to 1 mile	1 00
23A.	150-Mile House, Barkerville and Quesnel Lake	1 inch to 1 mile	1 50
24A.	Anderson and Seton Lakes, Lillooet District	„ „	1 50
24B.	Lillooet District (Clinton, Big Bar, and Bridge River Valley)	„ „	1 50
25.	Mainland Coast, Hecate Island to Princess Royal Island	„ „	1 00
26.	Porcher and adjacent Islands	„ „	1 00
27.	Fraser River Valley (Williams Lake, Soda Creek, and Alexandria)	„ „	1 00
27A.	Fraser and Chilcotin River Valleys, Dog Creek	„ „	1 00
27B.	Lac la Hache and Northern Lillooet	„ „	1 00
28.	North Part of Babine and Tacla Lakes	½ inch to 1 mile	1 00
28A.	Stuart and Babine Lakes	1 inch to 1 mile	1 50
29.	Chilcotin, West 124th Meridian	„ „	1 50
29A.	Anaham and Abuntlet Lakes	„ „	1 50
29B.	Nazko and Chilcotin River Valleys	„ „	1 50
30.	Bonaparte River Valley and Canim Lake	„ „	1 00
31.	Bulkley Valley	„ „	1 50
31A.	Francois and Babine Lakes	„ „	1 50

TABLE E.—DEPARTMENTAL REFERENCE MAPS—*Concluded.*

Price-list of Blue-prints—Concluded.

		Scale.	Price.
32A.	Tatlayoko Lake	1 inch to 1 mile	$1 50
32B.	Homathko and Klinaklini River Valleys	„ „	1 50
34.	Lot 4593, Kootenay District, West Portion, Flathead River	2 inches to 1 mile	1 00
34A.	Lot 4593, Kootenay District, East Portion, Flathead River	„ „	1 00
35.	Saltspring, Gabriola, and adjacent Islands	1 inch to 1 mile	1 00
38A.	Groundhog Coal Area, East of Meridian	„ „	1 00
38B.	Groundhog Coal Area, West of Meridian	„ „	1 00
38C.	Upper Nass River Valley	„ „	1 00
39.	Euchiniko Lake and Upper Blackwater River Valley	„ „	1 00
40.	Tetachuck and Euchu Lakes	„ „	1 00
42.	Big Bend, Kootenay District	„ „	1 00
42A.	Adams Lake and River	„ „	1 00
42B.	Canoe River Valley	„ „	1 00
42C.	Columbia River Valley (Vicinity of Bush River)	„ „	1 00
43.	Peace River, South of Dominion Government Reserve	„ „	1 00
45.	Foreshore of Vancouver Island (E. & N. Railway Belt)	„ „	1 00
46.	Saanich District and Islands	„ „	1 00
47.	Peace River Valley, West of Dominion Government Reserve	„ „	1 50
48.	Crooked and Parsnip River Valleys	„ „	1 50
49.	Pine River Valley, Peace River District	„ „	1 00
50.	Parsnip and Peace River Valleys	„ „	1 00
51.	Finlay River Valley	„ „	1 00
52.	Atlin Lake and vicinity	½ inch to 1 mile	1 00
53.	Telegraph Creek and Stikine River Valley	„ „	1 00
54.	Upper Nass River Valley and Meziadin Lake	1 inch to 1 mile	1 00
18-9S.	Rossland and South end Lower Arrow Lake	„ „	1 00
17-9S.	Nelson and Salmon River Valley	„ „	1 00
16-9S.	Moyie River Valley	„ „	1 00
15-9S.	Elko vicinity	„ „	1 00
15-9N.	Fernie and Crowsnest vicinity	„ „	1 00
16-9N.	Cranbrook and Kootenay River Valley	„ „	1 00
17-9N.	Kaslo and Kootenay Lake	„ „	1 00
18-9N.	Edgewood and Lower Arrow Lake	„ „	1 00
15-0.	Elk and White River Valleys	„ „	1 00
21-23.	Duncan Lake and Columbia Lake	„ „	1 50
18-20.	Nakusp and vicinity	„ „	1 50
27-29.	Columbia River Valley, Wilmer and Spillimacheen	„ „	1 50
30-32.	Trout and Upper Arrow Lakes	„ „	1 50

NOTE.—These reference maps show lands alienated and applied for, "Timber Limits," "Coal Licences," etc., surveyed and unsurveyed. They are compiled from all available data and are constantly being amended, and their accuracy is therefore not guaranteed. They were prepared originally for Departmental use, and, having proved of value to the public, are now on sale.

VANDERHOOF, FRANCOIS, DECKER, AND BURNS LAKES.

By H. C. Black.

December 6th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I arrived at Vanderhoof on July 23rd to make the surveys to the north of that town and to the north of Chilko. There is a good road from Vanherhoof to Chilko, and a road had been cut out from there to the work, so that I was able to use a team the whole way. The country through which this road passes is flat and covered with small poplar and jack-pine. On the way we passed a pre-emption of which 140 acres was under cultivation and the final 20 acres was being cleared up. There were some other farms in the locality having about 100 acres under cultivation. From Chilko I went to Township 20, Range 5, following the same road till north of Vanderhoof, and then taking the Stuart Lake Road, and finally a branch road which took us on to the work. The land around here is timbered with jack-pine and poplar, and is on a series of low flat hills forming the summit between the Nechako and Stuart Rivers.

From Vanderhoof I went by train to Savory, where I was met by the pack-train. The wagon-road which was used during the construction of the railway was in good order for the few miles that we wanted to use it. About half-way to Priestly we took a trail across the Endako River and up Tchesinkut Creek. The land suitable for agriculture in this valley is about two miles wide and is lightly timbered. The soil is mainly sandy loam, which gets stony on climbing the hillsides. At present there is only a trail into the valley, but a road has been started, and a bridge for that purpose has been built across the Endako.

From here I cut a trail southwards to Francois Lake. There does not seem to be much agricultural land between the two. Along the north shore of the lake there are patches of poplar land separated by steep ground. This continues to within a few miles of the Burns Lake Road. There is good agricultural and grazing land along the west end of the north shore of the lake. This part of the lake is reached by a wagon-road from the railway at Burns Lake. A new road is being projected to replace the present somewhat hilly one, as the traffic to the Francois and Ootsa Lake Districts is considerable. Near the end of the Burns Lake Road the Government is operating a motor ferry-boat across Francois Lake, and when necessary tows a barge for vehicular traffic going to the Ootsa Lake country.

From Francois Lake I worked northwards to Burns Lake, where the Government recently laid out a small townsite. The sale of lots was held at the end of October. At present there is only one store there, but two others are starting now that they have got lots to build on. There are prospects of good business ahead of them, as it will be the main distributing-point for the Francois and Ootsa Lake Districts, and it is at the end of a good road-grade to Babine Lake, though the road at present is only suitable for heavy traffic during the winter.

Passing through Burns Lake, I went on to the north-west end of Decker Lake. To the north and west of Decker Lake is open poplar and jack-pine land, and from local information there is room for a good settlement back from the railway, though the best land appears to be along the railway, but has already been taken up.

From Decker Lake I went to a point about two miles south of Rose Lake, where a couple of families have taken up eight pre-emptions among them, and are hoping to get other settlers in around them.

The war, as in other places, has taken away many of the men from this part of the Province, so that things are not progressing very fast at present, but the outlook for the future of this district is good.

I have, etc.,
H. C. Black, B.C.L.S.

SODA CREEK AND ALEXANDRIA, CARIBOO DISTRICT.

By R. W. Haggen.

J. E. Umbach, Esq., October 8th, 1917.
Surveyor-General, Victoria, B.C.

Sir,—In accordance with your instructions dated June 23rd, I have made surveys of pre-emptions, and ties, in the vicinity of Soda Creek and Alexandria, Cariboo District, and have the honour to submit the following report thereon:—

The first work of the season was the location of the old townsite of Soda Creek and the survey of additional lots within it. The original survey of this townsite was made in 1863 by one of the Royal Engineers; he showed the position of old buildings on his plan, and these buildings are still standing as portions of the present buildings. Though numerous patches show where fires have started, they seem to have a charmed life; and these buildings at Soda Creek are probably the oldest in the Cariboo. The town came into existence at the time of the gold-rush in the late fifties; at that time a steamer was built at Soda Creek and operated between that point and Quesnel, at which place the road to Barkerville leaves the Fraser River. Being the foot of navigation, Soda Creek became a village of importance in the country, and was for some years used as a supply-point for the Chilcotin District, and also, partially, for the Beaver Lake and Quesnel Forks Districts.

Until 1915 steamers continued to operate on the Fraser, and Soda Creek was the southern end of their run, so retained a certain amount of trade. After that, owing to a change in mail service, the steamer was replaced by a gasolene-launch plying between Quesnel and Fort George only, and to-day Soda Creek is practically without transportation and very little business centres there. By the building of the bridge at Chimney Creek the 150-Mile House was made more convenient to Chilcotin and the trade of that section was diverted.

Soda Creek may be considered as the northern limit of the Dry Belt extending along the Fraser River. Fruit does well in the village, and corn and tomatoes can be ripened every year. There is considerable good farming land tributary, but owing to absence of market it is not being worked to full advantage. All the beef available in the district has found a ready market this year, while sheep and wool have also been sold. A number of pre-emptors are, however, staying on their holdings, and whenever the Pacific Great Eastern Railway is completed there should be a good production from the district.

The two largest ranches near the village are those of Messrs. Hargreaves and Hoops, both of whom have large areas in crop and run fair bunches of cattle. Cattle and sheep can be driven to markets, but freight cost is so high that the export of grain or produce is out of the question.

After leaving Soda Creek I proceeded to the vicinity of Macalister, thirteen miles to the north, from which point I surveyed some tie-lines and a couple of pre-emptions on the hill to the east of the Fraser Valley. The pre-emptions are taken up on account of some hay meadows, and the settlers have done considerable work in clearing and draining them. Apart from the meadows, the country is rough and rocky, the vegetation consisting almost entirely of jack-pine.

From Macalister I moved over the road which passes the north end of McLeese Lake to the Big Camp meadows; this road continues to Beaver Lake, where it connects with the road from 158-Mile House to Quesnel Forks. In this locality I surveyed two pre-emptions, and made ties, connecting the outlying lots with the surveys in the Beedy Creek Valley. The pre-emptions are both taken up for hay-growing, one containing a natural meadow and the other a piece of good bottom land; their altitude is too great for anything except hay-growing. Apart from the meadows the land is of no value; it is rather stony and the soil is poor, while there are hard frosts every month in the year. No attempt is made to grow vegetables, except of the hardy varieties, and they do not do well. However, the hay grows to a great height, while in the woods there is a luxuriant growth of soft feed for cattle. Mr. Foster, at Big Camp, and Mr. A. P. McInnes, on Beedy Creek, both have small herds of cattle.

From Whitestone Lake, the easterly limit of my work, I made a trail to Tyee Lake, and then surveyed more pre-emptions and ties in that locality. At Tyee Lake there are some patches of excellent soil, a deep black loam. The altitude, 2,800 feet, would lead one to expect that summer frosts would be too severe to enable good crops to be raised, but for some reason this locality seems to enjoy a certain immunity. The only garden there was in excellent shape, and good potatoes were obtainable during the first week in August. Other garden produce was in good

condition. In the country surrounding there is a considerable amount of cottonwood, with jack-pine and some fir. There is a luxuriant growth of peavine and vetch—excellent summer feed for fattening cattle for the market, provided they can be killed for a market close at hand. While cattle fed on this feed will be in excellent shape for beef in the fall, they are too soft to stand the drive to the present market, 150 miles distant; it is the stock fed on the harder feed, such as bunch-grass, that stand the long drive. When the railway is completed the district in the localities of Big Lake, Beaver Lake, and Tyee Lake should be able to produce good beef, selling it at good weight when two years old. It should also be a good country for raising hogs and for mixed farming generally.

Tyee Lake is about twenty-four miles from the 158-Mile House, on the Cariboo Road, and fifteen miles from Soda Creek; roads run to both points. The lake is four or five miles long, a very pretty body of water, and drains through Marguerite Lake to Beaver Creek, a tributary of the Quesnel River. I was somewhat curious to find out whence the name "Tyee." A night-line solved the conundrum, the lake abounding in ling of large dimensions. Fish formed a very welcome addition to the camp menu, and were a welcome change from ancient bacon. No trout were caught, though there are reported to be plenty in the lake. There are shoals of whitefish.

From Tyee Lake I continued the surveys in the direction of Soda Creek, surveying several pre-emptions and making a tie which will enable the country to be shown in good detail on the maps.

Ascending a hill from Tyee Lake, one soon reaches the upper waters of Soda Creek, which comes out of a lake to the north-west of Tyee Lake on a high ridge. After the creek crosses the road it flows through several meadows, eventually reaching Peavine Valley, a narrow pass, in which the country is open. This valley is deceptive. On first looking at it one forms the opinion that it is splendid land and can easily be irrigated from Soda Creek and two creeks which enter from the hill to the north. However, these creeks go underground as soon as they enter the flat, and attempts at irrigation have been a failure, as the water always sinks. Moreover, it is an exceedingly frosty valley, and would seem to be useless for anything except pasture. There is no sign of the creek throughout the greater portion of the valley, which is about four miles long; the creek comes out of a cliff again below the Peavine Valley at Lot 9480.

The two pre-emptions surveyed on the creek above Peavine Valley contain meadows of good size but poor quality. However, time and drainage may make them of value. The other pre-emption contained a bench on which there is good soil and some open land. However, the area of this is small.

In travelling from Tyee Lake to Soda Creek Townsite there is a short cut over a trail which passes to the north of Peavine Valley. This trail is a portion of the one originally built from Soda Creek to Quesnel Forks, and when one travels over it the fact becomes apparent that trail-building is now a lost art. The old bridges are now rotted out; but signs are still to be seen of grading and drainage which at small cost enabled a trail to be built over which a horse could carry a good load—I should think as good a load as it could carry on the main roads to-day. I have not seen a trail built in more recent years that compares with this for sensible construction. The road follows the trail from Tyee Lake to Big Lake.

On the ridge to the north of this trail there are some copper claims, and I understand the assays show the quality to be good. However, until the railway is completed, nothing is likely to be done with these claims, and under the best circumstances they will be about twelve miles by very hilly road from a station.

After completing this work I surveyed four pre-emptions within a short distance of Soda Creek, one of them being at Morgan Creek, one at the confluence of McLeese Creek and Soda Creek, and two along the Cariboo Road to the north of Soda Creek Townsite. They are all decidedly hilly, containing only a small proportion of arable land, but all having a certain amount of merit. Grain and vegetables can be raised in the district without any necessity for irrigation, and these can be raised on the pre-emptions mentioned. Where Soda Creek comes out of the cliff near the east boundary of Lot 9480 it brings a deposit of a whitish substance, whence the name "Soda." I do not know what the correct name of this deposit is; while it has been assayed many times, I have never heard the result, except that it is said to be of no commercial value. I have never seen a deposit resembling this anywhere else, and it lies in the creek-bed 30 and 40 feet deep. In appearance it is silicate.

Having completed the work in the vicinity of Soda Creek, I moved to Cuisson Lake, about ten miles south-easterly from Alexandria, and continued the work started from Macalister earlier in the season, carrying on surveys from a tie made at that time. Two pre-emptions were surveyed at Cuisson Lake and a tie made to Lot 9170, at the south end of the lake.

The land here consists of some hay meadows and good patches of land near the creek, where the soil is a loam and the vegetation consists of poplar and willow. In favourable seasons good garden produce can be raised, and hay grows excellently without irrigation. An Indian has been on one place near the lake for forty-three years, and has a fair crop each year.

Cuisson Lake is about three miles long, lying in a north-westerly direction, and being near the head of Cuisson (Four-mile) Creek, which crosses the Cariboo Road and enters the Fraser River at the 190-Mile post, Alexandria. The Indians do some fishing in the lakes; there are some trout and the usual lake assortment of squaw-fish and suckers, which the Indians appear to relish. Cuisson Creek, after passing through this lake, drains through several lakes and hay meadows for about five miles of its length. These are all included in former surveys, except one brushy meadow, which is now held under pre-emption record, and which I surveyed as Lot 9485, lying to the north of the former surveys. It is probable that all these meadows can be drained, though it will take time; if they are drained the area of hay land thus reclaimed will be large and sufficient to provide winter feed for a large number of cattle.

I surveyed another pre-emption to the west of the largest of these meadows. A Dane has taken it up, and I was agreeably surprised at the improvements he has made on the place; though in occupation for a comparatively short time, he has put a good fence around the place, cleared and drained a good portion of meadow, and built good buildings. If he had some stock there would be no difficulty in making a living off the place in its present shape.

I surveyed two more pre-emptions to the east of the Alexandria Indian Reserve; they consist of a little bench land near the road which runs from the Reserve to Cuisson Creek, and, with the exception of this bench, are very hilly. There is a growth of fir around them. These settlers have built good houses and done a little clearing. One, however, has answered the call to arms, and the other has found it necessary to work away from his place a good deal, so very little work other than building has been done. Each of these places will raise small crops, the area of arable land in each case being rather small.

The last survey made was that of a pre-emption near the head of Alix Creek, about three miles to the east of Moffat's ranch, on the Cariboo Road. This lot contains some bottom land near some small lakes and will raise fair crops. The settler has done some building and considerable improvement.

At this time the weather became very inclement, and there were as severe storms as I have ever seen in the district.

It was difficult to get a party in the district this season, especially at the first of July, when haying was in progress. However, I was able to get labour enough, having the chief trouble over camp cooks. While there used to be a plethora of these in the country, they have become an almost extinct species during the past two years, and during the greater part of the season it was necessary to make shift as best we could, with one or other of the axemen presiding at the frying-pan. The professional cook has developed a new idea, which is that surveying operations are not to take precedence over his convenience, and he prefers a road camp, which moves camp at longer intervals, to a survey camp, which is moved frequently, and where the outfit carried is as light as it is possible to work with. At certain times during the season some of the ranchers were short of help, but, so far as I have learned, all were able to get sufficient men to harvest their crops. There has been a steady efflux of people from the district; the number of men enlisting has been large, while others have left for other scenes of industrial activity.

The two industries of the district are agriculture and mining. The former is the industry of the greater part of the district; the latter, of the Barkerville and Quesnel Forks localities. The Tertiary Mine, at Cottonwood Canyon, about twenty miles above Quesnel, on the Fraser River, has employed on an average about eighteen men all season, and the Cariboo-Chisholm Creek Company has employed about the same number at Van Winkle, in the Barkerville region, opening up a new property there. The work done so far on both properties is purely development; the indications are that both will be successful ventures. In addition to this there was the usual amount of placer-mining carried out in the Barkerville District.

Quartz-prospecting has attracted more attention than formerly during the past season. Two ledges of promise have been found—one gold-bearing near Barkerville, and the other carrying copper and lying about two miles east of Cuisson Lake. The discoverers have been working on these ledges all season, but I understand that to date sufficient work has not been done to prove up the extent. Mr. Galloway, of the Mines Department, was on the ground this season.

Gold-washing on the Fraser and Quesnel Rivers, which attracted a number of men a couple of years ago, is now practically abandoned. This employment yielded a labourer's wage during the season, but, with the present demand for labour, men can do much better elsewhere.

The season was a good one for the mining companies, there being more water available than in the average years. The season was also good for the farmers, and the crops of hay were well above the average; while grain and vegetables did well in all sections of the district. A number of cattle and sheep were sold this season, there being a good market for these.

Very little game was seen throughout the season. Deer seem to be no more plentiful, but the grouse, which had nearly disappeared, are more plentiful again. There are some bear.

Throughout the season I did not see any areas where there was commercial timber. There are areas on which there is a growth of fir, but it does not average much milling-timber per acre; while it is not, as a rule, easy of access. The district in which the surveys were made will never be a lumbering one, but will, when the Pacific Great Eastern Railway is built, speedily develop into a good agricultural district; and there will always be a considerable amount of mining done in the outlying sections.

I have etc.,

R. W. Haggen, B.C.L.S., D.L.S.

MOFFAT CREEK AND HORSEFLY RIVER, CARIBOO DISTRICT.

By F. Tupper.

November 12th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—Under your instructions dated June 11th, 1917, I have the honour to submit the following report on the work done by me in the Lillooet-Cariboo District during the past season:—

With the exception of a few scattered pre-emptions, etc., in the vicinity of Horsefly Creek and Lac la Hache, Lillooet District, the whole of my work lay in the Cariboo District between the 52nd parallel of latitude, which is the Lillooet-Cariboo boundary, and Harpers Camp or Horsefly River. This particular tract is known as the Horsefly country, and apparently takes its name from the countless millions of horse-flies that infest this country during the summer months.

The work completed in this district consists of the survey of thirteen pre-emptions and four Government lots containing a total area of 2,500 acres. The total acreage surveyed during the season was 4,560 acres.

I also completed a traverse of the Horsefly Road from the 52nd parallel northwards to District Lot No. 2589, which is within about three miles of Harpers Camp, a distance of twenty-nine miles. Also a traverse of the Eagle Lake Trail, a distance of 8.7 miles. There were several other short tie-traverses and tie-lines, making the total mileage of traverse and tie lines run 46.5 miles.

Agricultural Possibilities.

With regard to this Horsefly country, it cannot by any means be classed as an agricultural district. The elevation for the most part is too high, and summer frosts are frequent and severe, which make the growing of grain, etc., very uncertain. It is, however, good stock country, and stock-raising is what the pre-emptors purpose going in for.

The areas they have taken up are very suitable for the growing of hay and winter feed generally, while they have unlimited range on which to run their stock in the surrounding country. Several of the settlers experimented with oats during last season, but they failed to ripen. Root-crops, such as carrots, turnips, mangels, etc., did well, but potatoes were an absolute failure this year.

The country is well watered by numerous lakes, sloughs, creeks, etc. The timber consists, for the most part, of jack-pine and poplar, with a little fir in places. There are numerous small swamp-hay meadows from which considerable quantities of swamp-hay can be obtained.

TRANSPORTATION.

The country is very easy of access by the Horsefly Road, which runs from the 115-Mile House, on the Cariboo Road, northwards to Harpers Camp, thus running right through what is known as the Horsefly country. There is also a branch trail running eastwards from a point about three miles north of the 52nd parallel on the Horsefly Road to Eagle Lake. This is known as the Eagle Lake Trail, and is very rough at the present time, but could with comparatively small expense be made into a good road.

The Horsefly Road at the present time is in rather a bad state of repair; many of the culverts badly need renewing, and in some places the road has become somewhat overgrown with brush, etc. The whole of this Horsefly country is within easy distance of the Pacific Great Eastern Railway.

CLIMATE.

During the summer months the days are long and warm, but, as before stated, summer frosts are frequent and severe. The average rainfall is said to be about 15 inches. The snowfall is heavy, and the temperature occasionally goes as low as 60 degrees below zero.

GAME.

Game is fairly plentiful. Deer and bear can be got with comparative ease in the hilly country, while, in the fall, ducks of all kinds abound on the lakes and sloughs. Grouse have become very scarce during the last two years. Two successive severe winters and horned owls are said to be the cause of this. A few years ago they were very plentiful.

CONCLUSION.

In conclusion, I would state that in my opinion this country is well suited for stock-raising, but unlimited range or large holdings are necessary to make a success of it. Owing to the altitude and the climatic conditions generally, farming, I think, will not prove a success and is not likely to be attempted to any great extent.

I have, etc.,

FRANK TUPPER, B.C.L.S.

GREEN LAKE AND 83-MILE CREEK, LILLOOET DISTRICT.

BY W. S. DREWRY.

December 12th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report completion of work in the field under your instructions dated June 18th, 1917, and beg to submit the following account of operations:—

GREEN LAKE LANDS.

The first work undertaken was a survey of pre-emptions south of Green Lake and contiguous lands in Lillooet District. The area embraced consists of flat lands along Green Lake and the lower gentle slope of a ridge lying between the lake and North Bonaparte Road.

The soil is a black loam from 3 to 18 inches deep, with clay subsoil, generally free from stones. No cultivation of these lands has been attempted, but, judging from the character of vegetation, the soil would be quite suited to agricultural development, although the range of products would, of course, be limited by altitude above sea, which is about 3,400 feet. This surmise is strengthened by the fact that immediately across Green Lake settlers have very good gardens.

This whole area with surrounding unoccupied lands appears to present first-class dairying and grazing possibilities, as there is ample summer feed, plenty of good water, and shelter. Only one meadow of considerable extent was noted, but there are small ones on some of the lots.

Numerous springs of good water are to be found scattered through the region. The water of Nolan Lake, although warm in summer, is wholesome, and the creek flowing from it to Green Lake through Lot 4540 would serve to irrigate about 120 acres of that lot, about 20 acres of which are brushy prairie. While it is believed that irrigation is not necessary to the growing of crops on these lands, there is no doubt that in dry seasons a certain amount of irrigation would add greatly to crop production, especially that of hay.

The timber is mostly poplar mixed with some pine, the latter predominating on the slopes back from the lake. The forest is quite open, it being possible to ride through it freely on horseback, and little of the timber reaches 1 foot in diameter. There are openings of from 1 or 2 to 20 acres in area, most of which produce bunch-grass as well as other varieties. The ridge lying immediately to the south carries large fir for saw-timber and is quite accessible. Considerable of the pine timber is of the lodge-pole variety, growing clean and straight, being of value either for saw-timber or building-logs.

This locality may be reached at present by a trail about four miles long from Tincup Lake, on the north Bonaparte Road, twelve miles east of 70-Mile House, on the Cariboo Road. It may also be approached by a branch from the Green Lake Road around the easterly end of the lake, whence a trail of about two miles reaches the lands in question and continues through them. This latter route, although longer, is the easier one in reaching the tract.

83-Mile Creek.

Having completed work along Green Lake, camp was made at a spring near 83-Mile House, on the Cariboo Road. A connecting traverse was run from the north-west corner of Lot 3422, surveyed in 1914, north-westerly to Lot 350 (83-Mile House), and thence westerly about six miles to Brown Lake, which is apparently the source of 83-Mile Creek.

East of 83-Mile House there is considerable good meadow land partly occupied by Lots 350 and 473. An exceptionally good lot of 160 acres was surveyed adjoining Lot 350. There is more good land to the north and south-east of the lot surveyed, but available money did not permit further subdivision at that time. There is a road from 83-Mile House down the valley to the Pacific Great Eastern Railway and Green Lake, but a portion of it requires improvement by removal of boulders.

West of 83-Mile House there are several meadows of considerable extent, partly occupied by Lots 474, 2632, and 2633; but additional Lots 4636, 4637, 4638, and 4639 were surveyed, embracing the more important meadow areas outside the lots previously surveyed in that locality. Nearly all the upland is so stony as to be of no value as tillable land, although some of it affords fair summer pasturage.

The whole valley and uplands immediately adjoining seem to be capable of supporting from 700 to 1,000 head of cattle if a comparatively small expenditure were made in cleaning out the creek, putting in dams for flooding, ditching, and clearing brushy parts of the meadows. To obtain maximum results from these works the whole should be correlative, and therefore might possibly better be carried out by either an individual or company.

A road has been cut from 83-Mile House to Brown Lake by settlers, but is so boulder-strewn as to be absolutely dangerous for vehicular traffic.

An ascent of Mount Begbie having been made with the purpose of obtaining an outlook over the surrounding country, there appeared to be a number of large meadows lying west of the Cariboo Road in the unexplored country between Mount Begbie and Little Bridge Creek.

93-Mile Creek.

93-Mile Creek was next visited and a pre-emption surveyed, connection being made to Lot 626 on the Cariboo Road and Lot 4262 of the general survey made in 1914. Extensive meadows succeed one another from the Cariboo Road south-easterly about three miles. The uplands have a gently rolling surface comparatively free from stones, and are wooded with open pine and poplar of small size, some spruce bordering the meadows. This upland pasture in connection with the meadows in proximity to the Cariboo Road and the Pacific Great Eastern Railway, less than four miles distant, would seem to constitute an exceptionally good location for dairying and grazing enterprises.

The lands in question are some 3,800 feet above sea-level, and, while no cultivation has been attempted locally, it may be predicted, from results obtained a few miles away at about the

same altitude, that the hardier garden products, such as onions, peas, carrots, turnips, cabbage, etc., may be successfully grown. Timothy and other grasses will probably do well if grown on the uplands.

The creek has a definite channel at the Cariboo Road and near the north boundary of Lot 4641, but elsewhere, for about two miles from the road, sinks in the meadows, beyond which there is a good flow of usable water.

A passable road has been cut by settlers from a point about half a mile north of the creek crossing on the Cariboo Road to Lot 4261, and might easily be extended some two miles to the Pacific Great Eastern Railway, or about four miles to the Horse Lake Road. Further subdivision might be made advantageously in this section.

GAME AND FISH.

The presence of a few mule-deer and bears were noted, although none of the latter were actually observed. Varieties of wild ducks were fairly numerous; but other bird-life was almost entirely lacking in all this country, which formerly abounded in game.

The owls and coyotes, having nearly exterminated willow, sharp-tailed, and Franklin grouse, apparently have either died or been driven by hunger to other parts of the country, as their calls were seldom heard, while in previous seasons night was frequently made hideous by their cries. There are, however, a few grouse left, and it would seem that the country might have a chance of restocking itself if the numbers of owls and coyotes can be kept down. It is thought that if a moderate bounty of 50 cents was paid for each horned owl destroyed, many settlers would become in effect game wardens active in the true conservation of game.

POSSIBILITIES AS A RESORT.

Green Lake, about ten miles long by one wide, is only one mile east of the Pacific Great Eastern Railway, and is a very lovely sheet of water with attractive surroundings, having many miles of clean sand and fine gravel beaches. The water, while slightly unpalatable, is beautifully clear and bright, having an extremely agreeable temperature for bathing purposes from the latter part of June until late September.

The lake discharges into North Bonaparte River a few miles above a considerable fall, below which trout are abundant. These fish are not known to exist above this fall, although there are many apparently suitable lakes in which suckers are found, as well as squaw-fish. These are poor food-fish and afford no sport; but if these waters were stocked with trout they would be valuable to present residents as a food source and as an attraction to prospective settlers and parties who might desire to spend a few weeks in the open.

I have, etc.,

W. S. DREWRY, B.C.L.S.

FRASER RIVER VALLEY WEST OF PAVILION, LILLOOET DISTRICT.

BY GEO. S. BOULTON.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

October 4th, 1917.

SIR,—I have the honour to submit the following report on surveys of pre-emptions in the Fraser River Valley between Bridge River and High Bar, also in the vicinity of Kelly Lake and on Pavilion Mountain:—

KELLY LAKE.

Kelly Lake (elevation 3,600 feet) lies at the junction of the Lillooet-Clinton and Clinton-Dog Creek Roads. The Pacific Great Eastern Railway skirts the southern shore of the lake and has a station (Lough Raymond) at the eastern end. Over 2,000 head of cattle from the ranges to the north and west were shipped last fall at this point. The waters of Kelly Creek divide on the property of the Western Canadian Ranching Company, flowing easterly through Clinton to the Bonaparte and westerly through Kelly Lake to the Fraser River. To the north along the Dog Creek Road there is very little land suitable for agriculture, the valley being narrow and the mountains on either side very steep. Only two parcels were surveyed in this valley, and two on the north side of Kelly Lake. There is a fair stand of timber, mostly fir, on the mountain-sides in this locality.

Pavilion Mountain.

Three parcels of land were surveyed, and these, together with the Gillen, Carson, and Bryson ranches, make up all the agricultural land.

The elevation is about 3,600 feet at the southern end, rising to 3,800 feet on Lot 912. To the west and north the mountains rise to an elevation of 4,000 feet, and to the east to an elevation of 5,000, while to the south there is a steep descent to Pavilion Creek at an elevation of 2,300 feet.

The main road from Lillooet to Clinton passes over Pavilion Mountain, and from Pavilion Creek rises in a series of switchbacks on a steep grade. In order to negotiate this hill in safety when bringing a loaded wagon off the mountain it is necessary to fell a tree and drag it behind; this gives an unlimited supply of firewood to the Indians at the Pavilion Rancherie.

The soil varies; in some parts it is a chocolate loam, while in others it is a good clay loam. The chief crops grown are timothy, oats, wheat, barley, potatoes, and garden-truck.

Owing to the limited supply of water for irrigation purposes, the crops in a dry season like the past one suffer to a considerable extent. Summer frosts were experienced in the first week of August, but were not severe enough to do any material damage. The mountains to the west and north are lightly covered with fir, pine, and poplar.

From Pavilion Mountain a move was made to Pavilion for a few days, and one pre-emption, on the east bank of the Fraser River opposite Moran Station, surveyed. At this point the elevation of the railway is 2,800 feet and that of the river 900 feet, the railway being distant about three-quarters of a mile from the river.

From Pavilion northerly on this side of the river, with the exception of a few small benches opposite Moran, there is no good land till Butcher Creek near High Bar is reached. Leaving the road about a mile west of Pavilion Station, a trail branches off to the river and a crossing is made by rowboat ferry opposite Lot 2985.

Lee Creek to McKay Creek.

Between these two points there is some excellent bench land about 2,000 acres in extent, and, with the exception of the portions under cultivation, lightly covered with sage-bush; all either alienated from the Crown or held under pre-emption record. At the time of the Cariboo gold-rush most of this land was under cultivation, growing wheat, which was milled at Pavilion and packed by horses to Barkerville. At present the chief drawbacks are the lack of transportation facilities and a proper system of irrigation. There appears to be sufficient water in the creeks running through this land to properly irrigate the whole of it; at present some ranches have an abundance of water and are not using it to advantage, while others have none.

The soil is mostly silt, from 18 inches to 2 feet deep, on gravel, and is capable of producing large crops; as many as four crops of alfalfa have been cut in one season. Beans are now being grown in this district, and at the present prices should prove a very profitable crop. The elevation of these bench lands varies from 1,300 feet at Lee Creek to 1,800 feet at McKay Creek.

From McKay Creek northerly to Watson Creek there is very little level land, the mountains encroaching close to the river. At the Indian Reserve on Leon Creek the Indians have a number of small benches under cultivation.

Watson Creek.

On Watson Creek seven parcels of land were surveyed, containing about 1,000 acres. There is a break in the mountain range along the Fraser River at this point, and the mountain on the north side of Watson Creek is about a mile to the west of the river. The land is rather badly broken by ridges and gulches, but there are numerous small benches capable of producing, with water, good crops. As there are good ranges to the north and west, cattle-raising is gone in for extensively in this locality.

Watson Creek is capable of supplying all the water necessary for irrigation, both for its own valley and for the McDonald ranch to the north, but the creek, running between steep banks some 200 feet below the level of the bench lands, has not up to the present been used for irrigation purposes.

Between Watson and Ward Creeks lies the McDonald ranch, containing some 500 acres of very good bench land. The chief crops grown are alfalfa and oats. The later varieties of apples, also plums, pears, and peaches, are grown with success. The land surveyed to the north of Ward Creek is badly broken and is only suitable for range.

There is a cable-ferry on the Fraser River near the south boundary of Lot 395, connecting with a road running to Kelly Lake and Clinton; the distance to Clinton from High Bar is thirty miles.

CLIMATE.

Very hot weather was experienced during August, a thermometer kept by the ferryman at Pavilion registering 100 degrees in the shade, and this at the river-level. The nights were also warm.

Rain fell on only three occasions in this month for short periods. No rain fell in September till the 25th, the day the party left the district, but on several days during the two preceding weeks very high winds occurred. These winds, coming chiefly from the south-east, attain a very high velocity and occur during the latter part of September. From information gathered at High Bar, the first snow arrives about Christmas and leaves about March 1st; average depth about 8 inches. The river starts to freeze about the first week of November; average frost, 10 degrees below; maximum, 20 degrees below for a few days. Heavy rainfall in June and early July.

MINING.

Several prospectors are working on the upper reaches of Watson Creek, but with what success is not known. Wages are still to be made during low water on the bars of the Fraser River.

Kelly Lake affords good sport to the fisherman, being well stocked with rainbow trout up to 5 lb. in weight. Few grouse were seen, and as the fame of the mountainous country to the west for big game is so well known, no further mention is necessary in this report.

I have, etc.,

GEORGE S. BOULTON, B.C.L.S.

NORTH THOMPSON RIVER VALLEY, KAMLOOPS DISTRICT.

BY JOS. E. ROSS.

November 29th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report in connection with my survey of pre-emptions on the North Thompson River during the past season:—

The lands surveyed lie from thirty to forty-five miles almost due north of Kamloops. They can be reached from Kamloops by wagon-road on either side of the Thompson, but more conveniently from Barriere, a station on the Canadian Northern Pacific Railway. Barriere, at the mouth of the Barriere River, is the local headquarters for business. It consists of a store, sawmill, hotel, and blacksmith-shop, and is looked on as the nucleus of a coming town. The only highway bridge on the North Thompson is located about two miles above this point.

The outstanding natural features of the North Thompson are the mountains, low, broad-topped, evenly timbered, and buttressed on the river-side by series of hills more or less open and of varying degrees of steepness. In contrast to these are the bottom lands, narrow stretches along the river seldom exceeding half a mile in width. The latter comprise the best farming lands, and consequently have been taken up and settled on some years ago. The lands now being pre-empted are mostly bench lands and the more gently sloping side-hills. They are not well adapted for farming, being stony and broken.

This part of the district is in what might be termed the outskirts of the Dry Belt. The vegetation indicates a greater moisture than at Kamloops. The naked hills of farther south are replaced here by those more "richly clothed in Nature's verdant garb!" The poetic view, however, does not usually appeal to the surveyor. To be contending with thickets of brush is not conducive to the sentimental or artistic.

The soil is light, varying from sand and gravel to a fine clay loam, but is quite productive when irrigated. Last summer the unirrigated crops stood well until the first week in July, when a dry, hot spell set in; from that time on they gradually wilted until a considerable part was scarcely worth harvesting. This section is well watered by mountain streams. The cost of

irrigating unfortunately is too great to permit of settlers undertaking the work individually. The formation of water communities or some such co-operative system seems to be the only solution. The cost of clearing land will run from $60 to $100 per acre.

The lands are, in general, timbered. On the south and westerly slopes the timber is open and chiefly bull-pine. On the opposite sides fir predominates, with a thick undergrowth. On Fishtrap Creek there had been considerable good timber, but it has all been logged off. Peterson and Chinook Creeks were originally heavily timbered. Now the greater part is covered with small birch, cottonwood, alder, willow, and a most luxuriant growth of brush. The remaining timber—black-pine and fir—is mostly small, but well suited for railway-ties, piles, and electric poles. Since the advent of the Canadian Northern Pacific Railway tie-making has been the main industry during the winter months.

Though nearly all the lands surveyed were taken up as pre-emptions, more than half of the pre-emptors were absent at time of survey. Some were serving their King and country on the battle-fields of Europe, while others were more peacefully engaged in the harvest-fields near home. A few of the settlers have made good progress notwithstanding the many difficulties they had to contend with, but the majority have made little improvement. The prevailing custom is to work out for a few months in the year at the best-paying jobs and then to retire to their cabins to lead a free-and-easy life. To make a success of farming here a person should be a most ardent devotee of the strenuous life.

As to the mineral possibilities, I can only say that prospectors showed me some good-looking samples of ore obtained in the neighbourhood. A little farther up the river near Chu Chua several prospects have been discovered, upon which development-work is now being done.

As a hunting-ground this section of country has always been considered one of the best, but the game is gradually disappearing. Evidences of deer were noticeable everywhere, though but few of the animals were seen. We had a good view of a black bear ambling along the rocky side-hill close to our work. Grouse were not plentiful and rabbits were scarce. The *cayai* of the coyote is still heard.

Forest fires did little or no damage in this part. One swept over a considerable stretch of country, but only did good in cleaning off the brush so that new grass could come up. This is at least the view the stockmen take.

The water-power available on the several streams is too small to be considered, with the exception of that on the Barriere, which is all taken up by the hydro-electric system of the City of Kamloops.

Owing to the disconnected, mixed-up nature of the survey and the roughness of the country, the progress made was apparently slow. When nearly finished with the work allotted me I met with an accident through fire, which caused me to quit work and close camp for the season. The weather throughout from a surveying point of view was about all that could be desired, and the mosquitoes were less troublesome than usual.

I have, etc.,
Jos. E. Ross, B.C.L.S.

HATHEUME (HAZZOON), PENASK, AND STUMP LAKES, KAMLOOPS DIVISION OF YALE DISTRICT.

By O. B. N. Wilkie.

December 20th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report of the country covered during the past season's work:—

Having been instructed to organize a party and make surveys in the vicinity of Penask and Stump Lakes, Kamloops Division of Yale District, I beg to state that the party was organized at Merritt the beginning of July, from which point I proceeded by wagon to a camp at Hatheume Lake, which is two miles east of and connected by wagon-road with Penask Lake.

Having covered practically the same territory for the past three years, it will be unnecessary for me to give any time to a report of Merritt, Nicola, and vicinity, as my reports for 1914 and 1915 give a detailed account of these points and the surrounding district.

The road to Penask Lake from Merritt passes through Nicola, Quilchena, and Douglas Lake, the latter place being the headquarters of the Douglas Lake Cattle Company and distant about thirty-six miles from Merritt. This company has very large holdings here, with large herds of cattle and horses, and furnishing employment to many settlers on the neighbouring pre-emptions.

The country in this vicinity is particularly adapted to cattle-raising. Douglas Lake is a very pretty little lake about four miles long through which the Nicola River flows, and the elevation is about 2,600 feet. The adjacent country is generally open range land, portions of which are irrigated, and grows good crops of hay, wheat, oats, etc. The principal hay meadows of the Douglas Lake Cattle Company lie along the Nicola River and Chaperon Creek.

From Douglas Lake a wagon-trail leads into the Penask Lake District through open, hilly country. A few pre-emptions have been taken up along this trail. I noticed particularly one pre-emptor, Mr. Collins, whose land lies at an elevation of about 4,000 feet, was growing a promising crop of oats, some alfalfa, garden-truck, and potatoes. About eight miles from Penask Lake you enter more of a timbered country, principally jack-pine and poplar, the road from there on to Hatheume Lake being very rough—merely an ungraded trail cut out by the settlers.

Hatheume Lake (improperly called Hazzoon Lake) is a small lake about two miles long and about two miles east of Penask Lake and abounding in fish. The Indians visit it and make camp every year in certain seasons and take quantities of fine fish. The shores of the lake are timbered with a comparatively narrow fringe of tall black pine, and beyond this timber natural hay meadows lie interspersed with ridges of wooded country. This kind of country continues for many miles, scattered through which are many small lakes and willow bottoms.

The general contour of the country around Hatheume and Penask Lakes is a large basin surrounded by wooded hills, the elevation being about 4,500 feet. There are several settlers in this locality, and a few mowing-machines have been freighted in to cut the wild hay. Some of these settlers have cattle and others cut the hay to winter stock sent in from Princeton District, these cattle usually being driven from Princeton by way of One-mile (or Graveyard) Creek, then up Summer Creek to Missezula Lake, and from there up Quilchena Creek past Minnie Lake to Penask and Hatheume Lakes. Some timothy-hay has been planted, but, so far, no one has grown grain to any extent.

The trapping of fur-bearing animals, lynx, mink, beaver, bear, and coyotes, is a source of revenue for the settlers.

The Nicola River rises about eight miles south from this lake near Penask Mountain and flows through the meadows east of Hatheume Lake. There are good meadows near the source of this river; the bottom lands being good soil, while the pine ridges are very dry. A wagon-trail has been cut from Hatheume Lake to Princeton Crossing, a station on the Kettle Valley Railway about twenty miles away. There is also a horse-trail to Peachland, on the Okanagan Lake.

The country adjacent to Penask Lake is similar to that already described. This lake is a large body of water about ten miles in extent, with long arms reaching out in several directions. There are also several large timbered islands. An air of mystery surrounds this lake. None of the settlers can give any information about it, and the Indians have many weird legends regarding it. No Indian could be induced to go out on the lake for fear of supposed evil spirits. However, a party of three of us ventured out for a trip, and the only "evil spirits" we encountered were in the shape of huge boulders lying in rows just under the surface of the water, which would undoubtedly prove very dangerous if caught out there in a storm. The lake abounds in fish and is the headwaters of Spahomin Creek, which flows into Douglas Lake. Several pre-emptions were surveyed and a number of lots laid out for settlement.

From this point we moved camp to Stump Lake, where several pre-emptions were surveyed. The country around Stump Lake for about two miles on either side consists of high bunch-grass hills, beyond which lies a heavily timbered region, mostly bull-pine and fir. There are many prosperous settlers in this district, most of whom engage in stock-raising. Considerable dry-farming is practised, and good crops of wheat, oats, barley, and vegetables are grown.

Stump Lake is about thirty miles from Kamloops and the Canadian Pacific Railway and about the same distance from Merritt. The main Government road passes the lake. At the upper end of it is the McBride Cattle Ranch, which is a big concern, while on the east the Duke of Portland has large holdings. To the west the Stump Lake Cattle Company has a fine ranch with large herds of cattle. In addition to the extensive agricultural interests of the community, considerable mining development is being carried out.

After completing my work in this vicinity I finished up the season carrying out adjustment surveys near Nicola Lake, Otter Valley, and Arrowhead.

I have, etc.,

O. B. N. Wilkie, B.C.L.S.

TRINITY VALLEY AND MABEL LAKE, OSOYOOS DISTRICT.

By A. P. Cummins.

December 15th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following general report respecting localities in which I carried out, under your instructions, detached surveys of lands held under pre-emption records in the vicinity of Trinity Valley and Mabel Lake, in the Osoyoos Division of Yale District (Vernon Agency), during the past autumn:—

Trinity Valley.

Trinity Valley comprises the watershed of Trinity Creek and its tributaries. It extends from the height of land where crossed by the Government wagon-road, known as the Trinity Valley Road, between the watersheds of the East Fork of Vance Creek and Trinity Creek (elevation 2,500 feet), about seven miles and three-quarters north of the town of Lumby, northeastward and northward, to the valley of the Lower Shuswap River. It is traversed throughout its length by the Government wagon-road which connects the town of Lumby with that of Enderby, on the Shuswap and Okanagan branch of the Canadian Pacific Railway. The northern or lower end of the valley lies within the limits of the Dominion lands of the Railway Belt for a distance of about four miles south of the Lower Shuswap River. The lands to the south of this are Provincial lands.

At a distance some seven or eight miles from the southern or upper end of the valley it widens out to the eastward, forming a tributary or branch valley extending towards two low passes and up Lossy Creek, the most northerly pass between the watershed of Trinity Creek and that of Sowsap Creek, the latter stream flowing eastward into the southern end of Mabel Lake. The height of land in this pass is about 2,500 feet above sea-level. The second pass, a little farther south, leads over a somewhat higher summit to the head of Christie Creek, which flows into the Shuswap River a few miles above Mabel Lake.

The passes are separated by Bobbie Burns Mountain, a strikingly prominent peak, rising to a height of 5,000 feet above sea-level. The mountain ranges to the east and west of Trinity Valley basin rise frequently to heights of 5,000 feet above sea-level. The elevation of most of the agricultural area would probably range between 2,300 and 2,800 feet above sea-level.

All the land in the valley not entirely of a mountainous character has been taken up, amounting to about 12,000 acres, and of this about 8,000 acres may be said to lie in the main valley area, while about 4,000 acres lie in the eastern branch, west of Sowsap summit, and up Lossy Creek.

Timber.—The valley, including the benches and mountain-sides, were at one time heavily timbered, but devastating and intense forest fires have at different periods overrun the country, destroying the timber, except where, on the bottom lands, it has to some degree escaped.

There is no merchantable timber, though sufficient for settlers' uses. The country is now generally covered with second-growth timber of quite small sizes, including jack-pine, fir, tamarack, poplar, birch, etc.

Roads.—This section is well provided as regards main roads, which, however, in some locations should be widened as circumstances may justify. Most of the lands taken up are either traversed by or reasonably accessible to the roads.

The main Trinity Valley Road runs from Lumby northward to the head of Trinity Valley; thence down the valley following the general direction of Trinity Creek to the Shuswap River, and joining the road which runs between Mabel Lake and Enderby, at about eight miles from the latter place.

A branch road has also been built by the Government at the eastern branch of the valley, known as the Bobbie Burns Road, and now reaches a point about three miles on the Mabel Lake slope, east of the summit. Connection between here and the south end of Mabel Lake is partly by Settlers' Road and partly by the old pack-trail.

The road distances from Lumby to various points mentioned may be stated as follows: Lumby to Bobbie Burns Branch Road, 15 miles; Lumby to southern limit Railway Belt, 20½ miles; Lumby to beginning of Trinity Valley, 7½ miles; Lumby to junction with Lower Shuswap Road, 25 miles; Lumby to Enderby, about 35 miles; length of Bobbie Burns branch, 10 miles.

Markets.—The available markets and sources of supplies are Lumby and Enderby. The present mail and stage route is between Lumby and the Trinity Valley Post-office, situated on the aforementioned Bobbie Burns Road. The Enderby route would give more ready access to the railroad. The elevation of the agricultural land would range between 2,300 and 2,800 feet above sea-level.

Soil.—Throughout the valley the soil of the bottom land and of the benches differs in character. Upon the benches it is generally light loam of little depth, with clay subsoil overlying a rock formation of dark slate. It is a question to what extent the soil on the benches has been injured by the intense forest fires before alluded to. The opinion prevails that where so injured the soil will recover through clearing and tillage. In the bottom lands the soil has not been affected by fires, and is of greater depth and rich quality.

The land generally is best suited for mixed farming, although the distance from markets seems at present to be the great drawback. Some years ago the locality promised to settle up rapidly; since the war, however, and since the drop in the supposed value of land generally, some places are unworked. Many settlers have left and no new settlers have come in.

Cost of Clearing.—The cost of clearing on the bench lands has been estimated at $50 per acre, but some of the bottom lands, which have heavy timber, large burnt trees and stumps, would probably cost $100 per acre to clear. I am not in a position to say what area of land has been cleared up to the present or actual cost of such clearing. Natural meadow land not in need of clearing is of small extent.

Precipitation.—There have been no observations as to rainfall; it may, however, be stated that the precipitation is considerably heavier than in most of the White Valley area and the Vernon neighbourhood, where irrigation is used.

In ordinary seasons irrigation is not considered necessary; the past summer, however, has been exceedingly dry, and crops and gardens upon the benches have suffered badly in consequence; in fact, they have been almost a complete failure. Any endeavour to bring irrigation upon these lands, if possible, would be beyond the resources of any individual settler.

The snowfall varies considerably in different years, but it may be generally stated that the snow lies about 2 feet in depth, commencing to fall early in December and disappearing in March and April. Summer frosts are not frequent or severe. Domestic water on the higher lands is obtainable from shallow wells in most places.

As regards game: Deer, bear, willow, and blue grouse would seem to be plentiful.

Sowsap Creek and Mabel Lake.

From the height of land in the pass between Trinity Valley and the valley of the Sowsap (elevation about 2,500 feet) a small creek, locally known as Styx Creek, runs eastward to join the Sowsap at a distance of about two miles and a half from its source, close to the northern base of Bobbie Burns Mountain.

The Government wagon-road from Trinity Valley has been completed for about this distance. From thence Sowsap Creek runs south-easterly and falls rapidly in a narrow valley and canyon to the Shuswap flats, and into the south end of Mabel Lake (elevation 1,270 feet), in a distance of three miles and a half.

On Styx Creek and to the north lies a group of seven pre-emptions, about 1,000 acres, affording a fair quantity of bottom and bench land of agricultural value, and where brought under cultivation good crops have been obtained. These pre-emptions, though on the eastern watershed, have generally been considered as belonging to Trinity Valley, and are thus recorded. In continuation of these, on Sowsap Creek, two more pre-emptions include some good bottom land and bench land. Due east of here several pre-emptions have been recorded along the mountain-side to the north of the creek; these are unimproved and unoccupied and would seem of no agricultural value. They have not been surveyed.

At the lower end of the Sowsap Valley, on both sides of the canyon, five pre-emptions are surveyed, and about 240 acres lie to the north of the canyon and 560 to the south.

The area to the south, overlooking the Shuswap bottom lands, includes some good benches, which when cleared of timber will afford land suitable for agriculture and pasturage, of special importance in conjunction with the farms on the flats of the Shuswap Valley below. The soil is generally loam, with clay subsoil, and appears of good quality and depth.

A belt of fine timber, consisting of fir, white pine, cedar, tamarack, and birch, extends across the aforementioned pre-emptions on the first bench. Where reaching up the mountain-slopes the timber becomes smaller. This timber area will probably be systematically "cruised" by employees of the Forestry Branch, who will be able to arrive at a more exact estimate than has been possible for me. I have, however, concluded that, as regards the pre-emptions which I have surveyed, the average quantity on any quarter-section does not exceed 5,000 feet to the acre.

In the canyon of the Sowsap Creek, about three-quarters of a mile above the lake, falls and rapids occur; the creek falling in one place about 100 feet in a distance of 300 feet, which might be utilized for power.

Mabel Lake.

Mabel Lake is about twenty-three miles in length, extending approximately north and south. The Shuswap River runs into it from the south, and leaves it again on the western side, about twelve miles to the northward. It has an average width south of the outlet of about one mile and a quarter; the northern portion beyond the outlet becomes much narrower. The lake lies at an elevation of 1,270 feet above sea-level. Soundings showing a depth of 650 feet have been obtained. The mountains, rising abruptly from the shores on each side, reach elevations of over 5,000 feet above sea-level, leaving very little land possible for agriculture near the lake-shores. The region is heavily timbered. My personal examination extended only about five or six miles down the lake.

To the north of the outlet lie the Dominion lands of the Railway Belt. About 3,000 acres of Provincial lands near the shores of the lake have been taken up under pre-emption records, mostly at the sites of old or present logging operations. These holdings, as far as examined by me, are of little value, except for summer residences, and with respect to the value of the remaining timber.

The scenery is beautiful; there is good boating and fishing on the lake and hunting in the surrounding mountains.

The main industry of the whole Shuswap Valley has been lumbering for a number of years past, the logs being driven down the Shuswap River, towed across the lake, and eventually reaching the sawmills at Enderby.

More particular descriptions of the lots surveyed by me accompany the field-notes.

I have, etc.,

A. P. Cummins, B.C.L.S.

WEST OF OKANAGAN FALLS, SIMILKAMEEN DIVISION OF YALE DISTRICT.

By F. H. LATIMER.

J. E. Umbach, Esq., November 20th, 1917.
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report on the surveys made by me during the past season in the vicinity of Okanagan Falls.

Pursuant to your instructions, survey of the remaining unsurveyed pre-emptions was completed, lying west of and in the vicinity of Okanagan River, extending southerly from near Kaleden to the southern end of Myers Flat, or about nine miles in a north-and-south direction and four miles east and west. The party and outfit were moved out from Penticton into camp on July 24th near Marron Creek, and returned to Penticton on October 5th and 6th from the last camp, which was situated on Myers Creek, about half a mile south of the south end of Myers Flat.

This portion of the Okanagan Valley is well supplied with roads in excellent condition for wagon or motor travel. Coming from the north, the main trunk road leading south from Penticton, and which affords a series of beautiful views of lake and landscape scenery up and down the main Okanagan Valley, forks near Lot 2456 (S.), the main road continuing on south past Okanagan Falls, the other branch turning up Marron Creek Valley to the west, rising up to the higher benches near Marron Lake.

This lake, which lies in a narrow valley, forms one of the storage-reservoirs for Kaleden irrigation system. From here the road again divides, one road leading through a winding and mostly open valley westerly to a junction near Lot 906 with the fine trunk road which follows up Sheep Creek from Penticton to Keremeos, the other road continuing on past Twin Lakes to the old wagon-road, which was the "main" road in earlier days, to the Similkameen Valley from Penticton via White Lake. A more direct route is laid out and nearly completed from the road traced by way of Marron Lake, which turns west near the south-east corner of Lot 3186; thence past Yellow Lake and down a branch of Keremeos Creek to the former-mentioned main Penticton-Keremeos Road.

At the Junction Ranch, which is found a short distance south from the point already mentioned where the Marron Creek Road branches off Penticton-Okanagan Falls Road, another road continues southerly, rising and following an irregular valley past White Lake, at which point a road diverts westerly by way of Twin Lakes to Keremeos, the other continuing south by way of Myers Creek, through Myers Flat to Fairview, and down to trunk road next Okanagan River. Another road leads from Myers Flat, past a succession of small lakes, to a junction with the trunk road at Okanagan Falls.

At White Lake can be seen remains of old workings from which considerable coal was obtained in the early days and used locally for blacksmithing, serving the purpose very well, I have been told. The coal was taken from a shallow shaft, and no further recent developments have been made.

At Kaleden there has been laid out a considerable irrigation system, about half of which has been constructed. The water is conveyed entirely through pipes, the static head in some places being over 300 feet. A series of storage-reservoirs on Marron Creek form a part of this system, and are filled during high water from an ample supply in Sheep Creek, the water being carried through a low pass in ditch, concrete-lined ditch, and flume to the reservoirs. The main pipe is taken out from concrete intake on Marron Creek at a point on Lot 2455 (S.), first in a 16-inch wood-stave pipe which was put together on the ground and held with round iron bands spaced to conform with the pressure in the pipe. As branches are taken off the diameter is reduced, all pipe under 16 inches diameter being wire-wound wood pipe, the small service-pipes being of galvanized iron taken off from cast-iron fittings on the mains. A considerable number of the lots have been planted, and those receiving reasonable attention are doing well, the crops this year on the latter being very satisfactory.

At Okanagan Falls, near the outlet from Dog Lake, the Okanagan River drops some 14 feet in a beautiful cascade, immediately under the old highway bridge over the river. Recently a new bridge has been constructed a short distance above the falls, but the road, continuing down the west bank of the river, affords a fine view of the falls. On the east side of the river at this

point is situated the townsite of Okanagan Falls on an extensive flat, from which roads lead up the east side of Dog Lake (not yet quite completed through to Penticton), and others to the several irrigation developments lying easterly from the falls, as well as the main trunk road following southerly down the valley. The prevailing period of "hard times" which commenced some four or five years ago seriously handicapped these projects, but a considerable proportion of these lands will repay well-laid-out systems of irrigation distribution if properly protected by sufficient stored water in reservoirs, as is evidenced by orchards already planted and for which a sufficient supply of water is available.

Transportation of products at present must be by wagon to Penticton, or on boat or barge which makes regular trips or as required, to the north end of Dog Lake, and thence on wagon to Penticton, where connection can be made with the Canadian Pacific Railway boats on Okanagan Lake, or with the Kettle Valley Railway. A branch of the Great Northern Railway was surveyed several years ago up the valley from Oroville (a point on line operated to Spokane and Wenatchee) to Penticton, which crossed the river at the foot of Dog Lake and through Kaleden to Penticton. An earlier line surveyed up the valley to Penticton was the Columbia & Western Railway. Portions of the road-bed on this line were graded some fifteen or more years ago, here and there, on west side of Vaseaux Lake and near Penticton, but nothing further has been done since then, though it is quite probable that a line will be constructed in time that will afford a convenient outlet for the main valley and tributary lands.

Taken generally, the tract of land gone over in the present surveys consists of numerous narrow valleys on an irregular plateau, separated by broken hills which rise in some instances to a height of 2,000 feet above the valleys. Much of the lower slopes are open bunch-grass ranges with a varying growth of sage and greasewood, but in some sections, particularly towards Green Lake and northwesterly from it, there is considerable open timber consisting chiefly of yellow pine and fir. The tops of the hills are nearly always wooded, the bunch-grass being replaced with timber-grass, with some wild vetch and lupine. On some of the ranges and drier flats considerable spear-grass is seen, as well as prickly pear. In most cases the pasture and ranges seen were in fair condition, though the past season has been a particularly dry one and forest fires were of frequent occurrence in the neighbourhood. This area forms part of the Dry Belt, and on a large proportion of the lands a certain supply of water for irrigation is a necessity to assure good crops, or, in very dry years, any crop at all.

Mixed farming is being followed, generally speaking, though in more favourable years considerable grain has been raised, particularly west of White Lake and up Marron Creek, but unless water can be secured for irrigation in a dry season such as the past one no crop can be obtained, and other sources of income must be sought for to tide affairs over. Several thousand head of cattle are found in the main and tributary valleys which do well where sufficient range or pasture can be secured, supplemented by meadow areas where enough winter feed can be grown to carry stock over the usually mild and short winters.

All the streams in this vicinity of any considerable length sink and rise again at various points, depending on the volume flowing at the time and depth of loose surface soil. Marron Creek does not entirely dry up, but sinks even at high water at one point to come out in large springs as it nears Dog Lake. Myers Creek also sinks at Myers Flat, though running a considerable stream in low-water time near the south end of Myers Flat, where the Park Ranch ditch intake is situated close to the west boundary of Lot 20 (S.).

While a considerable area of the lands adjoining White Lake are held as coal lands and are lying idle at present, the possibilities of development as part of an extensive irrigation project has been considered several times, and a certain amount of investigation made, and it is possible that, when conditions are more favourable and more convenient transportation facilities are assured, a satisfactory development may be worked out. While it is hardly likely that a steam-railway can be considered probable, something of the nature of electric trolly-line may prove practicable, on assurance of the necessary traffic, since power may be obtained from the power-line being now commenced from Greenwood through by way of Fairview and the Similkameen Valley to Princeton. An irrigation scheme has also been considered in the vicinity of Myers Flat, but has not gone far as yet.

The soils in the lands surveyed are generally sandy to sandy or shaly loam, with black or sandy loam next the streams, but portions of Myers Flat, also near the Junction Ranch and thence south to White Lake, as well as other smaller areas, show indications of some alkali.

Practically all of the bottom lands have been taken up for some time, so that the lands comprised in these surveys only include a small portion or corner on bottom or gently sloping land, the remainder affording fair to good pasture or range, but lying in more or less broken slopes, and there is little land untaken that is not difficult of access or possesses much value for cultivation.

For ranch purposes never-failing water is an essential, but is often difficult and costly or impossible to obtain on the higher slopes, particularly towards the end of summer. On the lots surveyed this season water can be obtained with reasonable certainty on all but five, and probably on all but two, the latter two being decidedly uncertain—viz., Lot 2456 (S.), and Lot 2469 (S.).

I have, etc.,
F. H. LATIMER, B.C.L.S.

KEREMEOS CREEK VALLEY, SIMILKAMEEN DIVISION OF YALE DISTRICT.

BY H. N. CLAGUE.

November 30th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on my work in the Keremeos Creek Valley and vicinity, carried out under your instructions during the past season:—

My work consisted mainly of the survey of scattered pre-emptions, some of which had been held under record for a number of years.

Keremeos, the starting-point of my work, has a population of some 200 or 300 people, and is situated near the north bank of the Similkameen River, some forty miles south-east of Princeton. Transportation is provided by a branch of the Great Northern Railway, the terminus of which is at Princeton. From Keremeos good roads open up the country in three directions, one westerly and northerly up the Similkameen Valley, another easterly and southerly down the valley, and the third northerly up the Keremeos Creek to Penticton. There are some good stores in Keremeos and a very comfortable hotel. The district is served by the Government telephone and telegraph system.

A new fruit-packing and canning plant was lately opened, which will, I am sure, prove of great benefit to the district. There are some good fruit-farms adjoining the town, most of them being on the bench to the north, this being an excellent situation for most fruits. There are also one or two good dairy-farms in the neighbourhood.

After leaving Keremeos I proceeded up the Keremeos Creek Valley. The valley proper is quite narrow, being at the most less than half a mile wide. Some seven miles north of Keremeos the wagon-road forks, the main branch to Penticton still keeping north, following the Keremeos Creek. The valley here also forks, the Keremeos Creek branch being nothing more than a canyon, the right or north-east branch gradually narrowing up to Long or Yellow Lake, some three miles away. The main road follows the Keremeos Creek north for some four miles, the valley, if it can be called one, opening up in a few places to a few chains wide, all of which bottoms have been taken advantage of by settlers. After leaving the road the creek turns sharply to the west and rises very rapidly to its source, some six or seven miles away, at an elevation of about 7,000 feet. Numerous creeks run into the main creek from its source to the Similkameen river, practically all of them coming from the west.

On leaving the Keremeos Creek the road still keeps north for some four miles, rising rapidly for half the distance; thence descending quickly, all the time being in more or less of a rocky pass. From here the road swings easterly; thence north-easterly along the Sheep Creek Valley, where Allen Grove is reached, some four miles away. A little to the east of Allen Grove the valley joins up with the Marron Valley near the west boundary of the Indian Reserve No. 1. The Sheep Creek Valley proper is also narrow, being at its best much less than half a mile wide, at least in the portion of it which is covered by this report.

Referring back to the forks some seven miles north of Keremeos, a branch from the main road runs easterly, climbing very rapidly for perhaps a mile, then gradually descending past Twin Lakes to White Lake, some seven miles away. Near the east end of the Twin Lakes

another road runs northerly from this one for some two miles, at which point a road to the left goes to Yellow Lake, some three-quarters of a mile away; thence it rises rapidly to the north and west for about three miles, reaching a point near Little Sheep Creek, where a small bunch of settlers are located. The road to the east of Long or Yellow Lake runs north-easterly along a narrow valley for some two miles, where it forks, one branch running north up the Marron Valley, where it connects with the main Keremeos-Penticton Road; the other branch going easterly and northerly also to Penticton.

The lands covered by this report are, generally speaking, range lands, the area which can be brought under cultivation profitably being very limited; as the rainfall is light, being, I understand, from 8 to 10 inches, irrigation has to be resorted to. Where this is possible all kinds of good crops are assured, but where water is scarce on the high lands I doubt whether crops, other than hay and some kinds of garden-truck, would be profitable, unless perhaps with much cultivation of the soil, which does not appear to retain its natural moisture (rainfall) for very long at a time. Many months in the year the rainfall is practically *nil*. Heavy crops, such as oats, wheat, and barley, have been tried without irrigation, but the results as far as I saw were far from being satisfactory.

Soil.

The soil is very light and generally of good depth. The benches, although perhaps in many cases gravelly and rocky, have plenty of soil, and with irrigation, and where not at too high an altitude, would make excellent fruit lands.

Timber.

Timber is fairly plentiful generally on the high lands. There is some excellent fir and pine of good merchantable quality in the vicinity of Little Sheep Creek, and in sufficient quantities to warrant logging, which will no doubt be done at no very distant date.

Game.

Grouse, both blue and ruffed, are numerous, many fine coveys being seen, especially in the vicinity of the upper reaches of Keremeos Creek. Some rabbits were seen, but do not appear to be plentiful. But few deer and bear signs were noticed, although the former, I understand, are fairly plentiful in some parts in the fall and winter months. Small trout are found in some of the creeks. The Similkameen River affords good sport at certain times to those who are fond of fishing. Both trout and whitefish are to be had.

Climate.

The climate is dry and bracing, although a little more rainfall would not come amiss, especially in the summer months. The summers are fairly hot, but have the advantage of cool nights, with summer frosts occasionally; there being none to my knowledge this season. The winters are open, the snowfall not being heavy. Some rather cold snaps occur, but do not last for many days at a time.

Mining.

The district has evidently been fairly well prospected over for minerals, judging by the number of old workings to be seen, especially in the vicinity of Olalla and the upper reaches of Keremeos Creek, where there are numerous prospects, some of which will no doubt ultimately turn out to be profitable There is one good mine working at present in the district—the Nickel Plate, at Hedley, which is, I believe, a fine gold-quartz property, a striking example of a good paying mine. There is also a molybdenum property near Olalla from which shipments have been made lately, with, I understand, excellent results.

I have, etc.,

H. N. Clague, B.C.L.S.

VICINITY OF GREENWOOD, SIMILKAMEEN DIVISION OF YALE DISTRICT.

By B. A. Moorhouse.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

November 19th, 1917.

Sir,—I have the honour to submit the following report on my season's work during 1917 in the vicinity of Boundary Falls:—

The lands surveyed are situated within seven miles of the main highway from Midway to Greenwood, which is a part of the main motor-road across Canada, and this road also serves considerable traffic to and from the States, as it connects Spokane, Grand Forks, etc., with the Southern Interior of the Province known as the Boundary and Okanagan Districts. The Crows-nest branch of the Canadian Pacific Railway parallels this highway from Grand Forks through Greenwood to Midway, from which town the Kettle Valley Railway furnishes quick transportation to Vancouver and the Coast.

At Boundary Falls, a small town about ten miles east of Midway, and named because of the falls on Boundary Creek (which flows rapidly south-westerly to the main Kettle River), stores, post-office, and school are to be found; but, like some mining towns, this has seen better days, as evidenced by the numerous unoccupied dwellings, by the idle conveyors (or aerial tramways from mines now disused situated up the hills), and by the smelter and furnaces used in the boom days of the early nineties.

The few residents at this place either cultivate small orchards and truck-gardens or work in the mines and smelter in and around the rather busier town of Greenwood, three miles north, where the blast-furnaces are in full operation and some of the mines have taken on a new lease of life owing to the demands of the war. Work is to be found anywhere, as labour is very scarce and naturally well paid, providing for the residents, pre-emptors, and farmers plenty to do, thus helping to make all contented and happy with their lot.

The hills to the east of Boundary Falls are of considerable height, but invariably they lie in an east-and-west direction, whilst on the west of Boundary Falls they are somewhat long and run from north to south.

The work during the summer was both east and west of Boundary Falls, and as the general conditions vary so greatly I will report on the work to the east first; e.g., up the valleys of McCarron, Norwegian, and Lind Creeks.

McCarron Creek flows westerly into Boundary Creek near the falls, and is about eight miles in length. All the land up this creek has been prospected over and over again, as is evidenced by the numerous old workings and placer ditches, and also by the numerous mineral claims.

The land from four miles up the creek to Lot 2701 forms a valley, with about two miles of good farming and range land with a southern aspect, mostly cleared on the north bank of the creek, rising from an altitude of 3,200 to 5,000 feet above sea-level at the summit of the watershed between McCarron and Lind Creek on the north; the south banks, however, are generally very densely wooded with cedar, spruce, balsam, and willow in the bottom creek lands, and larger jack-pine, fir, and tamarack (some of which is 3 feet in diameter) towards the summit between McCarron and Norwegian Creeks.

These northern wooded slopes are steep and rough in places, giving only small places where level bench lands could be utilized. However, the bottom lands make excellent producers of hay, vegetables, etc., when cleared, whilst the southern slopes are producing grain, oats, and barley on the open lands.

On Norwegian Creek (wrongly named Douglas Creek) five lots were surveyed, four of which were taken up, and they all are fit only for the purpose to which the alienated ones are put—viz., range land for stock and tie-timber and cordwood for local consumption in the surrounding towns.

The country around McCarron and Norwegian Creeks is now all surveyed and practically all taken up. Roads are everywhere and are in good condition, giving access from Midway or Greenwood to all the most isolated settlers and to most of the lots except those of high altitude.

Lind Creek, the one next north of McCarron Creek, is practically similar in topographical features to its neighbour, and also the surveys made in this locality were tying-in surveys and bordered on Lot 2701 and lay to the south of Lind Creek. Densely wooded with a series of

steep slopes and intervening small level benches, the land rises to an altitude of 5,000 feet above sea-level, and is only good for cultivation after the arduous labour of the pioneer settler has cleared the dense jack-pine, fir, and willow; but five out of the six lots surveyed were already taken up, showing that pre-emptors do not mind the clearing of the land, especially when good roads give easy access to a market for the cordwood thus obtainable.

On the north bank of Lind Creek excellent hay and grass lands are to be found, where the farmers go in for dairying and stock-raising. The nearest market to the lands on Lind Creek is the mining town of Phoenix, which is situated on the same range of hills and at about the same level. It is the highest town in British Columbia, being 4,800 feet above sea-level. Its population is about 1,500, and because of the Granby Mine and others in the vicinity it is busy all the year round.

Its dairy produce, such as butter, milk, eggs, and much beef, etc., and cordwood come from the settlers around Lind Creek, making them particularly well contented with their holdings. Their chief need, however, is for adjacent range lands to their farms for their stock to winter on; and all of the eight lots surveyed this season, which were unalienated, were of this description and will supply some near rancher with the range he requires. Many are, however, anxiously awaiting the opening-up of Lot 2701, so that they can secure valuable adjoining range land and thus increase the stock-raising possibilities of their farms.

Kerr Creek (misnamed Jolly Jack Creek) is on the west of Boundary Creek and enters it opposite Norwegian Creek. It flows in a south-easterly direction and is about ten miles long. The land from the West Fork northwards, where the surveys were made this season, is more rugged, and consists of big rolling hills with deep draws and ravines well wooded on the northern slopes, and some open range land covered with grass on the southern slopes; some of which are being cultivated and producing vegetables, etc. Hay and grain are grown to perfection on the older ranches below the West Fork, thus giving an insight to the new-comers into the productiveness of the land when properly cultivated.

The summer was exceptionally hot and dry; no rain from June 20th to September 6th, and heat was up to 120 degrees in the sun, causing such a lack of moisture as to seriously curtail the hay and grain harvests. Some of the creeks dried up and many of the springs providing water-supply ran short. Such a drought has not been known for many, many years, but the farmers are balancing matters up as cheerily as possible by selling some of their stock and hoping for a mild winter to help range the others out. There were slight frosts on two occasions at night in June and July.

Summing up: There is a good market, with good roads close at hand, where cattle, hay, grain, and feed, together with all kinds of dairy produce and also cordwood, find a ready sale, and the lots are suitable in a varying degree for the raising of such products. The mineral wealth of the land has been proved years ago, and only requires such interests as the Granby Company to develop by the aid of capital and machinery.

Game is very scarce, possibly because of the slight contamination of the air by the sulphurous fumes emitted from the Greenwood smelter, and also from the fairly close settlement which results from the proximity to mining towns, and adds to the general social and more contented outlook upon life which the settlers possess.

The tie-lines to old mineral claims and the producing of the boundary between Lot 2701 and Lot 2702 curtailed the acreage surveyed this season.

There are parts, if a suggestion might humbly be offered, where 40 acres is the maximum area that one settler can conveniently cultivate, if he had, along with others, the use of enough rough acreage to give range facilities for his stock. It appears to me that this idea would be beneficial in such lands as are comprised in Lot 2702 and Lot 2701.

I have, etc.,

B. A. Moorhouse, B.C.L.S.

REDONDA ISLANDS, NEW WESTMINSTER DISTRICT.

By H. H. Roberts.

December 11th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report of the season's surveys in the vicinity of Malaspina Inlet and Redonda Islands, New Westminster District:—

The work assigned to me consisted of the survey of nineteen pre-emptions and the subdivision into parcels suitable for pre-emption of any adjacent Crown land. As in previous seasons, a gasolene-launch furnished transportation for the party, and proved very convenient for moving camp. A rowboat was fitted with an Evinrude engine, thereby increasing the radius of survey operations from one camp. The total area surveyed is 3,200 acres.

Lund, on the Mainland, distant about eighty miles from Vancouver, is one of the principal settlements in the vicinity of the season's work, and is a point of call of the boats of the Union Steamship Company. Lund has an hotel, general store, post-office, Government telegraph service, and facilities for repairs to boats and engines; it may be said to be the headquarters for settlers, loggers, and prospectors in the locality. In the neighbourhood of Lund several settlers have made their homes and have productive gardens and orchards.

Thulin Bros. have demonstrated on their ranch of 320 acres, of which about 50 acres are suitable for agricultural purposes, that root and cereal crops and garden produce can be grown successfully.

The crops raised on the ranch are turnips, mangels, carrots, parsnips, peas, tomatoes, and fruit. The farm is stocked with horses, cattle, and pigs; and a considerable amount of butter is made.

The hotel and farm buildings are lighted by electricity generated by water-power.

Malaspina Inlet.

At Sarah Point, which is about seven miles in a north-westerly direction from Lund, and may be called the north-west entrance point of the Strait of Georgia, the coast-line turns sharply round to the eastward into Malaspina Inlet. This inlet penetrates the Mainland eight miles in a south-easterly direction; it has a good harbour and several arms, at the head of which there is anchorage. The entrance to the inlet is studded with islands and rocks, and the navigable channel is narrow. Lancelot Arm, one of the arms of Malaspina Inlet, branches off at Selina Point in a northerly direction and extends in that direction for three miles. Wooton Bay, at the head of this arm, is only divided from Portage Cove, Desolation Sound, by a low neck of land not much more than 6 chains across, forming Gifford Peninsula, which rises abruptly near Portage Cove to a height of 1,000 feet, and has a part of the northern shore of Malaspina Inlet for its base, where the general elevation is about 300 feet. In the vicinity of Lancelot Arm three pre-emptions, three pieces of vacant Crown land, and several small islands were surveyed. The country covered by the survey is, generally speaking, rather rough, rocky, and broken; and the area of land suitable for agricultural purposes is very limited.

Lot 4933 is situated at the head of Wooton Bay, and contains the narrow strip of land which separates the bay from Portage Cove. This neck has been cleared by the settler and planted with fruit-trees, which are very productive. Another pre-emptor is located on Lot 4924, on the easterly shore of Lancelot Arm, but his improvements consist solely of a well-built house. The land on this pre-emption is rocky and broken and carries a medium growth of fir and cedar. Soil of a coarse, stony nature is found on benches small in area.

The pre-emption covered by Lot 4926 near the entrance to Theodosia Arm has been abandoned, but contains about 15 acres of good land, mainly situated at the head of small bay on the south boundary. Of the parcels of Crown land in Lancelot Arm, Lot 4607, fronting on the westerly shore, is the most desirable; it contains an area of about 94 acres and compares favourably with the parcels which are held under pre-emption. A valley in the central portion of the lot has several patches of black loam soil, and in the dry season has ample water for settlers' purposes.

Theodosia Arm.

Theodosia Arm has its entrance about one mile from the head of Lancelot Arm and extends about one mile and a half in a north-easterly direction, with an average width of one-third of a mile. The work in this arm consisted of the survey of Lot 4934. This area is held under pre-emption and contains about 50 acres of good land. The whole lot has been logged and burnt and is now covered by a second growth of alders.

Redonda Islands.

The Redonda Islands, two in number and known as the East and West Redonda, are separated from the Mainland by Desolation Sound, Homfray and Pryce Channels, while Lewis Channel divides them from Read Island.

Waddington Channel lies between the islands and varies in width from 10 to 80 chains. The shores of these islands are rocky, steep-to, and much indented; in many places they rise abruptly and precipitously to a great height.

Survey operations were confined to the West Redonda. In the vicinity of Refuge Cove, on the south end of the island, Lots 4936 to 4938 were surveyed. Pre-emption records of the first two lots were granted recently. The settler on Lot 4936 has built a house and got good results from his garden last summer; this pre-emption contains about 15 acres of good land.

Lots 4942 to 4944 front on Refuge Lagoon, which is connected to Refuge Cove at extreme high tides; at ordinary tides this lagoon can be reached by a portage of about 400 feet.

Refuge Lagoon is about two miles and a quarter long and its width varies from one-eighth to three-quarters of a mile. The settlers on the lagoon are making good progress, having considerable areas of land in garden and clearing. The prevailing soil on the holdings is sandy loam.

Lot 4941 adjoins Crown-granted Lot 2849 on the east, and is easy of access by a good skid-road leading from Refuge Lagoon. This lot contains about 10 acres of swamp-meadow land, having black loam soil underlying a covering of muskeg. After proper drainage and burning of the top covering this meadow would be very suitable for agricultural purposes.

Lots 4945 and 4973 have frontages on Lewis Channel. Lot 4945 adjoins Lot 4944 on the west and has about 10 acres of good land situated in a valley on the central portion of the lot.

Lot 4973 contains about 30 acres of land, in which the soil varies from sandy to black loam; this area probably contains the best land surveyed during the season. The settler is in occupation and his improvements consist of a house and garden.

Teakerne Arm, about four miles north of Refuge Cove, penetrates the West Redonda four miles in an easterly direction. At the entrance to the arm, Lot 4967, a parcel of vacant Crown land, was surveyed. This area, peninsular in shape, has been logged, and is for the most part rocky and broken, with a coarse shallow soil in depressions. Strips of fairly level land carrying a sandy loam soil were found at the head of a small bay near the westerly end of the lot. At the head of Teakerne an adjustment was made to the survey of Lot 3185. The settlers on this lot and on Lot 3768, lying immediately north, are working in partnership, and produced last summer excellent crops of potatoes, carrots, cabbages, lettuce, cucumbers, onions, and apples.

Four pre-emptions were surveyed in the vicinity of the Salt Lagoon, in the south-eastern portion of the island. Three of the pre-emptions, to which Lot Nos. 4969 to 4971 were assigned, front on the south shore of Black Lake, which drains into the lagoon. A distance of 400 feet separates the lake from the lagoon. The remaining pre-emption (Lot 4972) has frontage on both the lake and the lagoon. Several tracts of level land more or less swampy were found close to the water boundaries of these lots. The land back from the lake is generally rocky and broken, with a few benches carrying a coarse, stony soil. The lots are covered with a growth of fir, cedar, and salal.

Kinghorn, Martin, and Station Islands.

Kinghorn Island, off the southerly entrance to Desolation Sound, is about two miles in circumference and from 400 to 500 feet high. Its area is 190 acres. Its surface is for the most part rocky and broken, and high precipitous bluffs are a feature of the shore-line on the south-west side. Small patches of shallow soil are found in depressions on the north end. Scrub fir, cedar, and arbutus are the principal trees on the island. Water is scarce during the dry season.

Station Island, containing 12 acres, lies a quarter of a mile in a north-easterly direction from Kinghorn Island. This island rises almost perpendicularly from the water and its maximum elevation is about 270 feet. Its surface is composed of a series of rock bluffs and has a scant covering of scrub timber.

Martin Island lies close to the southern shore of the West Redonda. This island is low and rugged in character. Soil is coarse and shallow, with frequent exposure of rock. The area of the island is 112 acres.

General Remarks.

At the present time settlers supplement their pre-emption resources with work in the logging camps, hand-logging, and fishing during the packing season. The logging and paper industries and summer resorts along the Coast are a stimulus to land-settlement by providing convenient markets for such produce as can be raised.

There was inquiry during the summer by intending settlers regarding lands suitable for cultivation, fruit-growing, and poultry-raising.

The climate in the Redonda Island District is good; the rainfall is not very heavy and the snowfall is light. Deer, grouse, and fish are very plentiful.

I have, etc.,

H. H. Roberts, B.C.L.S.

JERVIS INLET, NEW WESTMINSTER DISTRICT.

By J. E. Laverock.

December 12th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to report herewith on survey-work carried out by me during the past season. This work lay along the shores of Jervis Inlet, Princess Louise Inlet, Hotham Sound, and in the vicinities of Stillwater and Sechelt.

Jervis Inlet.

Almost all of the surveys along the shores of this inlet have been made by private parties for the purpose of defining areas of timber land. Hence, where little timber existed on account of the rugged character of the shore-front, this latter had not come under survey, and areas of vacant land, whose dimensions were only approximately known, were thus left between the groups of surveyed claims. Scattered early surveys along the inlet had also of necessity been somewhat vaguely fixed in general location and appeared to conflict with later surveys.

The above conditions made the mapping of surveys along the inlet by your Department somewhat unsatisfactory in results, and several matters had arisen requiring that surveyed claims along the inlet be more definitely connected and placed. Under your instructions of July 6th, this has been accomplished by a careful traverse of the undefined stretches of shore-line between surveyed claims and by such tying-in of interior and old claims as was necessary.

Respecting Jervis Inlet itself, it may be stated that its entrance lies at a point on the Mainland Coast about sixty-three miles north-westerly from Vancouver. A secondary entrance is provided by Agamemnon Channel along the east side of Nelson Island, this latter lying between the two entrance channels. The inlet extends inland in a northerly direction fifty-two miles, with a general width of two miles. At about twelve miles up, or just above the head of Nelson Island, Sechelt Inlet branches off from the easterly side of Jervis Inlet and Hotham Sound branches off from the westerly side.

The most marked feature of Jervis Inlet is the mountainous nature of the country along its shores. It thus has considerable reputation from a scenic standpoint, but its practical possibilities seem limited. There is little chance for settlement along the inlet, there being but few areas of flat or gently sloping land along shore. Of these areas some have been logged over and could be feasibly cleared, but their soil is in general of poor quality, containing much coarse

grit and gravel. Several valleys tributary to the inlet contain limited areas of good land toward their outlets, but these valleys, being heavily timbered, are under licence for logging purposes and so not available for pre-emption.

Settlers on the inlet would also be at a disadvantage from the solitary location of their claims, and the difficulties of communication by water, especially in the winter season.

On the lower twelve miles of the inlet three settlers are occupying claims, but on the upper forty miles of the inlet only one pre-emption is under occupation. By the progress made I would judge these settlers to be more interested in hand-logging or shingle-bolting than in improving their claims for tillage.

In the matter of timber, many of the reasonably accessible bodies of such along the shores of this inlet have been logged off or are under process of logging, there being six camps in operation on the inlet at the present time. Fir and cedar, with a limited amount of hemlock, are the timbers obtained. There yet remains to be logged, however, the timber before mentioned standing in the valleys of the several small rivers emptying into the inlet. These valleys constitute the main resource of this region, for they are well timbered and would appear feasible for logging by railway for several miles inland.

Hand-logging is being carried on to some extent along this inlet, but the best ground for this purpose would appear to have been formerly worked over, and on the steep and rougher ground now available there is much waste and loss, due to timber smashing or "hanging up" where it cannot be handled. At the present price of timber, however, good pay is made at this work and it requires little outlay in plant.

Prospecting has been carried out intermittently on this inlet for the past twenty-five years. During the past summer the renewed general mining activity led many prospectors into this field and many claims were staked. Good showings of copper are reported on a group of claims located south of Britain River, and farther up the inlet prospects showing galena and molybdenum are reported. As little work has been done on any of the claims located their value is yet uncertain. However, from the many prospects staked the region would appear to be generally mineralized, and continued prospecting may disclose workable deposits.

The only place where active development-work was being carried out was near Beaver Creek, about fifteen miles up the inlet, where a group of copper claims carrying low-grade ore was being opened up by H. W. Treat, of Seattle.

The fishing industry on this inlet is confined to seining for dog-salmon each fall off the mouths of various streams which these salmon use for spawning-grounds.

Respecting scenic features, it may be mentioned that, on the upper forty miles of the inlet particularly, many massive and unusual mountain formations, towering peaks, as also fine snow-fields and waterfalls, are presented to view. Local yachtsmen and also those from Sound cities frequent the inlet to some extent, but on its merits the scenery of this region should be more widely known.

Princess Louise Inlet.

This inlet branches off from the east side of Jervis Inlet, about five miles from the head of the latter. My instructions contemplated the survey of three recorded pre-emptions along the shores of the inlet and the making of a traverse of its outlines, the same not having been previously mapped.

Of the above recorded pre-emptions two had been abandoned and the third was not under active occupation. These claims contained a minimum area of tillable land, and with the others on the inlet would seem to have been taken up for such timber as was to be found on them. In view of the foregoing and their having no general value as future pre-emptions, the above three claims were not surveyed.

In carrying out the traverse of the inlet two older surveyed claims were met with. The accessible portion of these had been logged and burned over. Only one claim was under occupation, and on it improvements consisted of a dwelling and a very passable vegetable-garden.

Princess Louise Inlet is four miles and a half in length, with an average width of half a mile. A rocky point at the entrance restricts the latter to a width of 60 yards, thus setting up strong currents at mid-tide, but as the latter approaches slack periods the entrance may be navigated without difficulty.

The shores of the inlet are closely flanked by a mountain ridge some 3,000 feet in height, and with little exception the shores rise abruptly to this ridge in precipitous slopes and sheer faces. The lower slopes and such narrow benches as occur are wooded. In passing up the inlet the scenic effect of such overtowering mountain masses close at hand is both unusual and impressive. At the head of the inlet several beautiful waterfalls and cascades are in view, as also a fine glacier on the sky-line. Over the northern ridge the dome of Mount Albert rises near at hand to an elevation of 8,250 feet.

The features above referred to, as also the general picturesque aspect of this inlet, constitute its main resource. It is thus the opinion of others who have visited the inlet and also of myself that its shores might well be put under reserve from attempts at logging or pre-emption. No land or timber of value would be withheld from use and the region is well worth preserving as a scenic resort. It is already patronized to some extent as such by local yachtsmen and by more elaborate cruising parties from Sound cities.

At the head of both this and Jervis Inlet, deer, goat, and black bear are hunted each fall, and farther inland grizzly bear are to be found.

Hotham Sound.

On completion of work on Jervis Inlet, surveys on Hotham Sound were next carried out. As before mentioned, this sound is a branch of Jervis Inlet. It is roughly triangular in form, having a width at its entrance of three miles and extending northerly for about six miles. The shores of Hotham Sound are in general steep and mountainous, and land and timber occur only in limited areas at various points along the shore-line.

Along the west side of the sound the shores are particularly steep and rock-bound, so that no land suitable for development occurs. Along the east side of the sound five pre-emptions had been recorded. Two of these had been abandoned and, being of no prospective value for homesteads, were not surveyed.

Of the three claims surveyed, Lots 4823 and 4824 I would consider to be valuable merely as home-sites, for the areas of tillable land on them are small and unfavourably situated and the soil unproductive and gravelly. The pre-emptors are, however, in active occupation and seem to have faith in the future of their claims.

Lot 4822, W. H. Tackett's claim, contains some 12 acres of level or gently sloping bench land, this fronting on a low gravelly beach. The above land had been logged over, but a great deal of small growth has sprung up, and the debris from logging is also heavy. The pre-emptor has, however, built himself a substantial dwelling and had under cultivation an excellent vegetable-garden. He is continuing clearing operations and will with continued effort make a creditable homestead out of this claim.

On the east side of the sound practically all readily accessible bodies of timber have been logged off, only small scattered patches remaining. On the west side a small body of timber is being logged off at the present time, and this will about clean up the available timber on the sound.

Two groups of mineral claims are under development toward the northerly end of the sound, the mineral sought being copper. Developments have not as yet proceeded far enough to predict successful production from these claims.

Stillwater and Thunder Bay.

From Hotham Sound camp was moved to a point on the Government road midway between Stillwater and Thunder Bay. In this vicinity five pre-emptions had been recorded. On investigation three of these claims were found to have been abandoned without giving formal notice, and these lands being of an inferior class were not surveyed as Crown lots.

Of the two claims surveyed, Lot 4829 includes within its boundaries a large rocky mound, and on the remainder of its area the soil is distinctly poor and gravelly. It is doubtful if this claim can be successfully developed, but the pre-emptor is in occupation of the claim, has built a well-finished dwelling, and is proceeding with clearing operations.

Lot 4821, a claim of 96 acres near Thunder Bay, has considerable possibilities. Its contour is generally level and its area is almost all good soil. This latter is mostly a loam of good depth, but there are also swampy areas with a clay silt or black soil which would require drainage. The land has been logged over and a great deal of the present growth is alder or small ever-

greens. Some improvement was formerly done on this claim by the pre-emptor, Hall, now deceased, but the buildings erected are now becoming dilapidated and clearing growing over. The standing of this claim as to ownership seems to be somewhat obscure, but it is to be regretted that the claim cannot be brought into use, for it could be developed profitably, being, as a further advantage, within convenient reach by road or trail of the logging centre of Stillwater.

Sechelt.

While returning to Vancouver a stop was made at Sechelt to survey a pre-emption three miles north-westerly from the landing. This claim adjoins a number of 40-acre lots thrown open for settlement some three years ago. These lands have in general a good contour and contain considerable areas of good loam soil, bearing an alder growth. The subsoil is hard-pan and in places a greater depth of soil would be desirable.

Pre-emptors in this district have made but limited improvements, and at present shingle-bolting and logging-work offer greater attractions.

On the claim surveyed little improvements had been made, the pre-emptor, C. Hanson, having enlisted with one of the Forestry Battalions shortly after taking up his claim, and being now on duty in France.

I have, etc.,
J. E. Laverock, B.C.L.S.

POWELL RIVER AND PORT HARVEY, NEW WESTMINSTER AND COAST DISTRICTS.

By D. J. McGugan.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

November 16th, 1917.

Sir,—Part of the season's work embraced certain portions in the vicinity of Powell River and Powell Lake. Here the writer was engaged in surveying some pre-emptions already held under record, and some portions of good alder-bottom land which previously had been unoccupied, and which the surrounding surveys disclosed. Also there were portions in the vicinity of Port Harvey and Minstrel Island, consisting of pre-emptions already staked and recorded, as well as some islands in Knight Inlet which were suitable for occupation.

Vicinity of Powell River.

In this district there is a keen desire for small tracts of land, which can only be construed as an endorsement of the work and standing of those settlers who have their own places in this district. This is more noticeable on the part of those who are employed, either for the whole or a portion of their time, with the Powell River Company, many of whom walk to and from work as many as three miles each way each day. A good many of these employees have their families on a 40-acre tract of land and are making the cultivated portions larger and more productive each year. By doing this they are saving rent, the cost of fuel, and a large portion of the grocer's bill. Each man has a fairly comfortable house on his place, and seems contented in the idea that he always has something upon which he may rely in case of necessity.

Then, of course, for those who take up land in a place too far distant to go to the mill from home every day there are two alternatives—either they can work a portion of their time in the mills around Powell River, coming home for the week-end, or they can very profitably devote their whole time to their ranches. The writer can safely say that of all those who had chosen the second alternative he found every one optimistic, and the reason was that every man knew that anything that was produced would find a ready purchaser at Powell River.

There is a brisk demand for all fresh vegetables and general garden produce. When vegetables are shipped up from Vancouver, the consumer must resign himself to the prospect of them being at least five days out of the ground, so naturally the man who can supply vegetables freshly picked will get a ready preference. This applies also to eggs, broilers, milk, cream, and butter. When one considers that there are over 2,000 people at Powell River, a shingle-mill and sawmill on Powell Lake, and numerous small logging camps in the neighbourhood, the possibilities of the demand may be realized.

Accessibility.—As is generally known, Powell River, being one of the largest towns on the Coast, and having one of the largest pulp and paper plants on the Coast, with its large pay-roll, has an excellent mail and passenger service. There is at least one boat each way each day, in addition to which calls are made by boats of the Union Steamship Line, which gives a service to all the Coast as far north as Prince Rupert. There is a telegraph-line giving connection to Vancouver and the East, and to all points as far north as the north end of Vancouver Island; also there is a good wagon-road south as far as Myrtle Point and north as far as Lund, with the exception of a gap of four miles through the Sliammon Indian Reserve. This gap is being reduced in length each year, as fast as the Government is able to make appropriations therefor. Also there are launches making regular trips up and down Powell Lake, and usually each man living by the water on either Powell Lake or the straits has his own launch. Thus, considering everything, Powell River is one of the most accessible places on the Coast.

Climate and Soil.—During the latter part of July and all of August there was only one day's rain, and from the testimony of the older settlers this seems to be the rule rather than the exception. This places this district in a different division from what is generally termed the Wet Belt along the Coast. In fact, records of precipitation of both snow and rain during the entire year in this district are much lower than the remainder of the British Columbia coast-line. This can only be explained by some physical configuration of the mountains which diverts the moisture-laden winds. Generally speaking, the soil is a sandy loam, with a clay subsoil. On the side-hills, which have been burned over, the soil is lighter, running more to a gravelly loam. Certainly, wherever the soil received any attention in the form of dry irrigation, or where there was any water, the growth of small fruits and vegetables left nothing to be desired.

Timber.—All this country was originally covered with a very heavy growth of fir and cedar, but about thirty years ago nearly all this stand was destroyed by a fire which raged all summer, and which worked its way in a north-easterly direction up around Powell Lake. As a result, a great many large patches are already cleared, but the lower portions, being damper, escaped the full severity of the fire, and here much of the old timber is still standing. Usually, too, in these lower places there is a dense second growth of fir, hemlock, balsam, and cedar. In these places, too, there is a great deal of fallen cedar which can be converted into shingle-bolts.

Game.—To the north of the Sliammon Indian Reserve, and extending toward Okeover Arm, there is a district where the settlers claim there are deer all the year round, where the cougar seems to have left them unmolested. Then, also, the prevalence of the wild blackberry brings down the black bear. Along the trails and more open places the willow-grouse are more abundant than along most of the Coast, and the settlers say they are increasing in number yearly. There do not seem to be many of the smaller fur-bearing animals, like mink, marten, or sable.

Vicinity of Port Harvey.

The country around Port Harvey is of a totally different nature and will appeal to a different class of settler. Cracroft, Minstrel, Turnour, and Gilford Islands are all heavily timbered, and with the exception of the land at the heads of bays, etc., there is not much agricultural land. The man who takes up land here is the man who is interested in logging and who knows the woods. On account of the extreme length of coast-line and the presence of good water for booming-grounds, it is eminently suited to the men who follow hand-logging. They usually work for six months in the year at logging, and then spend the remainder on their pre-emption, where they attend to their gardens, clear more land, fish, and hunt. Also there are numerous logging camps in the vicinity of Knight Inlet which will give them all the employment they wish, if they so prefer. Each man usually takes his family with him whenever he makes a change of abode.

Accessibility.—This country always has had a service of two boats a week from the Union Steamship Company. However, since the accident occurred to the "Cassiar," there has only been one boat a week on which any reliance could be placed, but this will only be temporary, as there is more than sufficient work for two boats. Practically every man owns his own gasolene-launch, and all his travelling is done on the water, which gives him access to all points in the district.

These islands are all low, the highest point being not over 1,500 feet in height. As a general rule, they rise gradually from the beach at an even slope, and except in isolated cases

are free from bluffs. There are numerous bays and indentations affording excellent shelter for launches or for booming-grounds for small booms.

Occupation and Resources.—Nearly all the settlers in this part are engaged in the logging industry, and they do well. One man whom the writer met up there put in 130,000 feet of cedar, fir, and hemlock this last summer by himself, which at the prevailing prices of logs promised to net him a very tidy sum.

Fish are plentiful, including cod, trout, sole, skate, salmon, and oolachan (somewhat larger than the Fraser River oolachan), and occasionally halibut. Following the oolachan, and living on them and other small fish, is the whale, which are to be seen nearly every day in Knight Inlet. Several of these have gone ashore in high tide when after the small fish and have been stranded. Needless to say, they were soon dismantled for the whalebone.

Opportunities.—In looking over the possibilities of this country, both at Powell River and Port Harvey, for something more extensive than small fruits and vegetables, the writer has come to the conclusion that goats and sheep offer the best opportunities. Goats are hardy animals, will thrive where cattle would starve, and in many parts of the States are proven to be a commercial asset. Also sheep would do well in the more open parts around Powell River, as there is a considerable growth of wild grasses in many parts. They would require extra feed in the winter, in the shape of hay and grain, but there are very few days in which they could not get some of their own food. Any country in which the deer live and thrive should, with some assistance, maintain a herd of goats.

I have, etc.,

D. J. McGUGAN, B.C.L.S.

VICINITY OF BLUNDEN HARBOUR, COAST DISTRICT, RANGE 1.

BY JNO. ELLIOTT.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

December, 1917.

SIR,—I have the honour to report as follows on the lands surveyed by me during the season of 1917 under your instructions of June 26th:—

Except for one pre-emption and a small amount of shore traverse on Knight Inlet, my work consisted of a survey of the north shore of Queen Charlotte Sound for some distance on each side of Blunden Harbour, together with such pre-emptions in the vicinity as were occupied or from which the owners were absent by permission.

The pre-emption on Knight Inlet lies at the head of Tsakonu Cove, a narrow bay on the south side of the inlet and about opposite to Sergeant Passage, which is the most easterly of the various passages or channels which communicate with the lower portion of the inlet. A creek of some size enters the head of this bay, and on the south bank of this creek, at its mouth, the pre-emptor has by a great deal of hard labour cleared a piece of ground which he has planted in garden. Save for the few acres at the mouth of the creek, the place consists of steep, rough mountain-side, covered in places with a fair quantity of timber, of which the most accessible has been removed by hand-loggers. From the head of Tsakonu Cove a trail about five miles long extends to Cutter Creek, on Chatham Channel, and from there it is but a short distance to Minstrel Island, which is in regular communication with Vancouver.

Leaving Knight Inlet I proceeded to Rocky Bay, on the west side of Wells Pass, and from there carried a traverse along the north shore of Queen Charlotte Sound to the head of a bay lying east of Stuart Point, a distance of about sixteen miles. This shore-line is rocky and storm-swept; even in the summer months the westerly winds, which spring up nearly every afternoon, are so strong as to render travel by small boat difficult and on many days impossible, and, judging by the piles of driftwood at the head of all the small bays with which the shore is indented, the winter storms must be very severe, and must, I am sure, render these small bays untenable; though when casually viewed in fine weather they would give the appearance of affording considerable shelter. Two exceptions to these conditions are to be noted—namely, Blunden Harbour, a small and almost landlocked harbour in which safety may be found in all weathers, and that portion of the shore, about two miles long, which is protected by the Rayner group of islands; it is in these two localities that the most settlement has taken place, and the greater part of my land surveys were made here.

The country may be described as rolling; that is, it consists of an irregular mass of hills rising to a height of about 500 feet, and in many cases precipitous, especially on the southerly sides. Between these hills occur small patches of level land varying in extent from less than an acre up to, in one case only, 80 acres; this level land is mostly wet, in some cases consisting of old beaver meadows which are comparatively open, but usually covered, as are the hills, with a poor quality of red and yellow cedar and hemlock, with a dense growth of salal-brush. I would estimate the cost of clearing and draining such land to be about $300 per acre, and extensive improvement will be hindered by the fact that most of the suitable areas are isolated from each other by the intervening hills, and so must be improved independently of each other. The streams are, with few exceptions, small and the water is of a most uninviting appearance, being brown in colour, though it would appear to have no injurious effects.

The areas under cultivation as yet are very limited and are confined to small patches of garden. Of these, the largest noted was that of Mr. Frank Simmons on Lot 1004, who had about half an acre growing potatoes and vegetables of very fine appearance and quality, and I have no doubt that such land as there is will produce abundantly of anything whose growth does not require a great deal of sunshine, because, although I consider this locality to be drier than most of the Coast District, out of eighty days in the field I had but four on which the sun shone all day; the prevailing fine weather conditions consisting of dense fog till about noon, and bright sunshine with heavy westerly winds for the balance of the day.

The present means of communication is by small boats to Port Hardy, on Vancouver Island, across twelve miles of open and treacherous water, and is not very satisfactory, but should there be any great increase in settlement I presume that Blunden Harbour will be made a port of call by some of the steamboats plying in the vicinity, though the lack of a light marking the entrance to the harbour may tend to prevent this.

I have, etc.,

JOHN ELLIOTT, B.C.L.S.

RIVERS INLET, COAST DISTRICT, RANGE 2.

BY C. C. SMITH.

J. E. Umbach, Esq., December 8th, 1917.
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the surveys carried out by me during this season:—

In accordance with your instructions, I proceeded to carry out traverses and triangulations in the vicinity of Smith and Rivers Inlets, the objects of my work being: (1) To join by traverse and triangulation the existing surveys (chiefly of lots and timber licences); (2) to define the shore-line and hence the location and area of the unalienated land between the parcels already alienated or surveyed; (3) to define the boundaries of the inlets as a whole so as to permit of accurate mapping; (4) to establish points so that the surveys of the inlets may be tied to the triangulation system being carried out by the Geodetic Survey of Canada, and thus make use of that triangulation as a base for the Coast surveys.

In triangulation a 5½-inch Cook transit reading by 2 verniers to 30 seconds was used and the method of repetitions was adopted. The accuracy desirable was that of tertiary triangulations in a geodetic survey, and it was necessary to reduce the cost per mile to a minimum, as the appropriation was small. The average closing error of about 6 seconds in the triangulation was considered sufficiently accurate. It would be preferable to use a 6-inch transit reading to 10 seconds, as the number of repetitions could then be materially reduced. The greatest difficulty was experienced in getting suitable targets. To avoid much clearing the stations were all taken close to the shore, where they were often in deep shadows. Also the colours of the background ran through the whole spectrum. Wooden targets were made from 4 to 8 feet in length, carrying rows of slats in two planes approximately at right angles, and paint, whitewash, or cotton was used on these. We did not carry lamps for observing angles at night, but I am convinced that it would be well to do so where the sides of the triangles are over one mile long, because when the sun is shining strongly the flicker and the shadows make the seeing very bad.

In stadia-work long courses were frequently used, and though something is lost in accuracy, the saving in time is very great, and with careful checking the loss in accuracy is very small. No standard make of stadia-rod is adopted to this work. My most satisfactory rod was one having two fixed targets and one movable target. The rod is graduated to read chains directly. My boat equipment consisted of a 40-foot launch, two rowboats, and a canoe. One rowboat had an overboard motor attached.

The weather on the Coast is generally very favourable for this kind of work. The comparatively small variations in temperature and the frequent cloudy periods combine to make the seeing steady. The fog which retards triangulation carried along the mountain-tops does not hinder shore-work to any great extent. During July and the first half of August, however, the strong westerly winds make it difficult to protect the rowboats.

A series of simple triangles was run from the head of Smith Inlet to the entrance of Smith Sound. This series consisted of forty-nine triangles, of which each angle was read. The stations were marked by cutting a cross in the rock with a cold-chisel. These can be easily picked up when required in future surveys. A base was chained at the head of the inlet, and two other sides of the series were measured by stadia. Where possible, intersection points were used to obtain the contour of the shore and to tie in posts of previous surveys, otherwise stadia traverses were run for this purpose. The surveys previously carried out in Boswell Inlet, Naysash Inlet, and Wyclees Lagoon, with its extension, Long Lake, were tied in and the survey of the boundaries of these inlets completed. As the shore of Smith Inlet and its tributary inlets is approximately 250 miles long, its definition necessitated considerable work.

In Rivers Inlet a traverse was carried from the north-east corner of Lot 196, in Open Bay, to a point about eight miles from the head of the inlet. The survey of Drainey Inlet shows it to be considerably larger than it has been previously shown, the South-west Arm extending to within five miles of Goose Bay, and the East Arm to within seven miles of the head of Smith Inlet. The relative positions of the lots on the south-east shore of Rivers Inlet are quite different from the position in which they are mapped.

Owikeno River, which is three miles long and through which Owikeno Lake empties into Rivers Inlet, was too high to pole or line up, so we had to pack a boat and canoe up the trail. The lake is thirty-eight miles long and consists really of four lakes connected by three narrows. Traverses were carried out here, connecting the surveys already made and defining the remaining shore-line of the lake. The mountains around the lake rise abruptly from the shore, excepting where the rivers enter the lake. The Machmell, Sheemahant, and Washwash Rivers flow through valleys of considerable width, and as they are heavily silt-laden they have built up deltas that are splendidly adapted to agriculture, being easy to clear and of good fertility.

Not very much of the country adjacent to Smith Inlet is adaptable to agriculture. Around Millbrook Cove and Takush Harbour there are areas (aggregating possibly thirty square miles) of land easily cleared and of good-looking soil. The soil needs some treatment that the settlers do not yet exactly understand to make it productive, though draining, exposure to the sun, and the application of lime seem to act effectively on it. When the timber, which aggregates about 2,000,000,000 feet, and of which 70 per cent. is cedar, is developed, there will be a good market for all the produce that can be raised in the inlet, and even now settlers are obtaining good results from any efforts at agriculture.

No outcroppings of mineralized rock of commercial value were seen, though quartz veins carrying small amounts of gold, silver, and copper occur in several places, and magnetite and marble are found at the head of the inlet.

The undeveloped water-powers capable of developing 20 horse-power or more are on Takush River, Canoe Creek, Smokehouse River, Beaver River, Caroline Creek, and Goose Creek.

I have, etc.,

C. C. Smith, B.C.L.S.

PORCHER AND BANKS ISLANDS, COAST DISTRICT, RANGES 4 AND 5.

By A. E. Wright.

December 5th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on my survey operations on Porcher and Banks Islands under instructions dated June 29th, 1917:—

In the original survey of pre-emptions in the neighbourhood of Welcome Harbour and Kitkatlah Inlet, Porcher Island, a large number of lots were surveyed off in blocks of from two to six pre-emptions. While all posts were supposed to be planted, the settlers had difficulty in locating their improvements by reason of the lines between posts not being run. Especially was this the case where lakes were to be drained. My work on Porcher Island was confined to the subdivision of these blocks by joining up the posts already planted.

The low-lying portion of Porcher Island from Welcome Harbour to Freeman Pass is dotted with shallow lakes, largely caused by the former activities of beavers. These lakes vary in size up to 80 acres in extent, and the improvements of a large number of the settlers consist of the drainage of these lakes. The acid lake-bottoms, consisting of a blackish or grayish muck, can, when sweetened by the application of lime and exposure to the air, be brought to a high degree of productiveness at no great expense.

The greater portion of this vicinity has been burned over about thirty-five years ago, and the original growth of timber mostly destroyed, although a strip of timber around the beach, of from 5 chains to a quarter of a mile in width, seems to have been untouched. Grass appears to grow wherever the moss has been destroyed by fire, but I should think that the moss would have to be burned off on several successive years before the grass would take hold.

For fertilizing purposes there is a cheap and never-failing supply in the kelp and seaweed which are washed up on the beach after every storm. On Kitkatlah Inlet there are also extensive beds of decomposed shell-fish which are exposed on the beach and could be used to sweeten the muskeg.

The climate is very mild in winter. Very little snow ever falls on this portion of the island, and the rainfall is considerably less than at Prince Rupert. Cattle, horses, and goats run out the whole year round and appear to do very well indeed.

To reach this portion of the island one must travel by launch from Prince Rupert or Refuge Bay. To Welcome Harbour from Refuge Bay is one hour's run and from Prince Rupert four hours. A good wagon-road connects Welcome Harbour with Kitkatlah Inlet, dividing into two branches about half a mile from Welcome Harbour. One branch goes to Dries Bay, and from there to the end of the peninsula between that bay and Serpentine Inlet, and the other branch goes direct to Serpentine Inlet.

Of the settlers the great majority have gone to the front, and most of those who remain engage in fishing during the summer months; practically all, however, had small gardens which, despite the late season, gave promise of a good crop.

The timber is of little use except to the settlers. Hemlock, spruce, and red and yellow cedar grow along the beach and on the bottom lands at the mouths of the creeks. The muskegs inland support a stunted growth of hemlock, yellow cedar, and jack-pine.

There has been no mineral discovered in the vicinity covered by this report, but on Baldy Mountain and on the northern extremity of the Belle Range there is considerable mining activity, copper and gold having been discovered in paying quantities.

That part of the island lying immediately to the east of Kitkatlah Inlet is much rougher than that to the west. The moss is not so thick here, probably because the fire burned more fiercely, and patches of reddish soil are seen. None of the settlers here or in the vicinity of the North Arm were seen. I believe that they are all either miners or fishermen and only live on their pre-emptions during the winter.

Of game, deer are abundant, especially in the vicinity of the North Arm, and are becoming more so since the wolves have been exterminated. Beaver were once numerous, but there are few left now. Many coveys of willow-grouse were seen during the summer. Ducks and geese come in great flocks in the autumn and winter, and a few stay over all the year round to breed.

Banks Island.

The northern part of Banks Island partakes in general of the remarks applied to the western portion of Porcher Island. The surface, with the exception of a strip a quarter of a mile wide along the shore, is covered with a growth of moss varying in thickness from a few inches to 6 feet. On this strip and along the creeks practically all the timber grows, which consists of spruce, hemlock, and red and yellow cedar up to 4 feet in diameter, but, with the exception of the yellow cedar, of very little commercial value. Inland the trees are mostly stunted yellow cedar, jack-pine, and hemlock. The greater portion inland is covered with muskegs dotted with lakes of various sizes up to 80 acres in area.

The settlers here have been in the habit of burning over the ground from time to time, with the result that grass is coming up and replacing the moss wherever burned over. Here, as on Porcher Island, considerable ditching has been undertaken, although I saw no crops on the land thus reclaimed.

The Italian colony at the head of Deadman Inlet has two horses which were brought out last winter. At the head of Deadman Inlet there is a meadow covered only by the 20-foot tides, from which enough hay can be cut to keep several head of cattle over a hard winter.

About five miles to the south of Deadman Inlet I surveyed out five pre-emptions. The holders here were all away fishing, with the exception of Tony Brooks, who left before I had moved my camp inland. The land here consists of fairly level muskegs and meadows, with the exception of the south-western portions of Lots 2051 and 2049, which are rough and rocky. To the east of Lots 1992 and 2053 there is considerable level lake land unsurveyed and not as yet taken up by any one. The timber here is much the same as that nearer the Coast. A few large spruce, hemlock, and cedar grow in the bottom of the large creek which flows between Lots 1992 and 2053. It would be of no value except to the settlers themselves. I believe that this creek empties into Bonilla Arm.

Deer are not so numerous as on Porcher Island, although several were seen during the three weeks which were spent on the island. Geese breed on the small lakes and are joined in the autumn by others which have bred in the Far North, remaining on the bays and inlets all winter. Ducks are very numerous in the autumn and winter and some stay all the year round. A large number of grouse also were seen. There are a few wolves, but the greater number of the once numerous packs have been poisoned or shot.

I have, etc.,

A. E. Wright, B.C.L.S.

NORTHERN VANCOUVER ISLAND AND ADJACENT ISLANDS, RUPERT DISTRICT.

By L. S. Cokely.

December 5th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—During the earlier part of the season I was engaged on surveys in the northern part of Vancouver Island in the vicinity of Shushartie Bay. We arrived at Shushartie Bay the latter part of June, and as a strike was in progress on the Coast steamers we landed with only a small portion of our outfit, and for about two weeks were handicapped by the lack of facilities. We were engaged in that locality for about a month on miscellaneous surveys.

Northern Vancouver Island.

The northern portion is very sparsely settled at present, many of the former settlers having enlisted or have been attracted to other points by the high wages being paid. In fact, in the territory tributary to Shushartie Bay there are no settlers living on their pre-emptions, and only two or three families living in the district.

Much of the country is too rough for agricultural purposes, being rolling, with some rather high ridges—Shushartie Saddle, about three miles inland, rising to a height of over 2,000 feet. Over large areas the soil is poor, being generally shallow with no subsoil. On land of this class the water naturally lies in pools, forming patches of muskeg, with a very stunted growth

of cedar and pine. Other portions have good soil, but all of the latter which is accessible at present have been alienated. As a whole, the surface is timbered with an inferior growth of hemlock, cedar, and balsam of no commercial value. A very dense growth of salal and salmonberry pervades all the timber, the growth of salal being nearly impenetrable near the salt water. Along the larger streams the timber is of fair quality, with some good spruce. There is no fir that far north.

There are no roads in the locality in which we were engaged, with the exception of about a mile built from the wharf at Shushartie Bay. The Government has constructed foot-trails leading to the various settled portions. The mail trail from here runs north-west, touching the settlements of Nahwitte, Cache Creek, Fisherman Bay, and Cape Scott. The Dominion Government operate a telegraph-line connecting all these points with the southern part of the island. South from Shushartie Bay the country is very broken and there is no trail to connect with Port Hardy, twenty-three miles down the Coast. As all the trails are foot-trails, the settlers have had to pack all their effects and supplies on their backs to their various pre-emptions. This fact alone would account for the short stay of the inhabitants, as after a year or two of back-packing in most cases they are very eager for a change. No stable population will be secured until roads are built, and roads are very expensive to construct, both on account of the physical characteristics and because of the excessive rainfall, with the consequent water-soaked soil.

Shushartie Bay is the farthest port north on the island touched by the Coast steamers. A store and post-office and a salmon-cannery are located here. Many of the inhabitants are engaged in fishing for the various canneries during the summer months, and all the canneries in the northern waters report a successful season this year.

On account of the dense undergrowth the country is difficult to prospect, and only a limited amount of prospecting has been done. There are no mines, although there are some indications of copper. At Gold Beach, eight miles north of Shushartie Bay, placer gold is found, and probably in all about $10,000 has been washed out there. This beach is opposite Nahwitte Bar, and evidently the gold-bearing sands have been washed up from the bottom of the sea.

THE ISLANDS.

We next moved camp to the islands to the north and east of Vancouver Island, camping first on Nigei Island, on Bate Passage. Here we were pretty well out on Queen Charlotte Sound, and as nearly all of our work for the next two months required the use of boats, we were handicapped at times by the rough water and heavy swell common on the sound.

We were engaged in traversing the coast-line of many of the islands, and as the shores are very rocky and precipitous, we as a rule had hard work to make a landing if the water was at all rough. When even a moderate sea was running it was unsafe to attempt to make a landing at many points; at such times we would select the most favourable spot and carefully pull the boat up on the crest of a breaker, when at the proper instant one man would make a jump for the shore. Then the operation would be repeated until the whole party was landed. As all these traverses were chained, the chaining frequently required all our ingenuity in coping with the cliffs and with the heavy swell with its shifting load of kelp and seaweed. At one point we were working in a heavy swell which finally caught our 5-chain tape and carried away all but a few links at one end. All winter long these shores are exposed to the fury of the winter gales, driving the vegetation back, so that we very seldom had to do any cutting on the shore traverses.

We used an 18-foot rowboat equipped with an Evinrude engine, which was a very satisfactory combination, as in many places there was no shelter for a boat and we had to pull it up on the rocks, which would have been impossible with a launch. Then, again, we had to cope with tides running as high as 4½ knots, which would have been out of the question had we to depend on oars.

These islands are all much the same, but vary greatly in size. All have the same character of coast, and the timber is much the same as on Vancouver Island opposite. Most of the merchantable timber near the salt water has been removed by hand-loggers.

On many of the islands, especially the smaller islands, good water is scarce; on all the islands in summer the water is about the colour of weak tea, although it does not seem to be injurious.

The two largest islands of this group are Hope and Nigei Islands; the former is reserved entirely for the Indians, who have two or three small villages at various points. Much of Nigei Island is worthless, as a large part of the interior is rock with only a shallow covering of vegetable matter, with a sparse growth of stunted hemlock, cedar, and pine. On the shores there is some good timber which is being held under timber licences, but many of the licences carry very little merchantable timber. Although the island contains twenty or twenty-five square miles, there is at present only one settler living on it. At the north-east corner there is a good little harbour on Queen Charlotte Sound, which is the only shelter in that vicinity. A sawmill has been built here, but is not being operated at present. At the opposite end of the island there is a good harbour, Port Alexander, which is much frequented as a port of refuge in bad weather.

The next largest island is Hirst Island, containing one and a half square miles. This island has all been taken up, and there are several settlers residing on it at present. A few settlers are scattered throughout the remaining islands. As all the communication among the islands is from necessity by boats, a convenient and safe anchorage is the first consideration in the mind of the settler. As these islands all lie in Queen Charlotte Sound, much rough water is encountered by the inhabitants, both among the islands and across Goletas Channel, which must be traversed to reach Port Hardy, the nearest store and post-office. Hirst Island, where the largest settlement is, is some ten miles from Port Hardy. During the fall and winter, when south-east storms are frequent, the islands are often isolated for several weeks at a time. Port Hardy, the nearest port of call for the Coast steamers, is served by three steamers a week in each direction, and is about twenty hours from Vancouver.

These islands, being out some distance from Vancouver Island, have a milder climate, with less snow and an earlier spring. As a rule, the summers are quite dry, with fine weather, but during August heavy fogs appear nearly every night, which are not dissipated until late the following morning. It is a peculiarity of this region that the most foggy weather of the year comes in August. At our various camps among the islands we were always within range of the mournful note of the fog-horns at Pine Island and Scarlett Point.

The soil where arable appears to be fertile and somewhat drier than the opposite portions on Vancouver Island. Small fruits and berries, as well as garden produce, do very well. The farmers have to contend with the pilferings of the many deer that the islands abound with, but to offset this they supply the only fresh meat obtainable. There are no wolves or panther, so the deer increase rapidly, being a contrast to Vancouver Island, in the northern portion of which deer are very scarce.

As might be expected, fish are very plentiful in the adjacent waters, and whales, porpoises, and seals are present in large numbers.

Quatsino Sound.

About October 1st we arrived at Port Hardy and packed across the trail to Coal Harbour, on Quatsino Sound, on the west coast. At this point a trail only ten miles long connects the two coasts, and a wagon-road is under construction at present.

Quatsino Sound affords one of the best harbours on the Coast, with many miles of protected waters. A number of industries have recently been established on the South-east Arm, the largest of which is the pulp-mill being constructed by Whalen Bros. This will be one of the largest on the Coast, although at present only the foundation of the mill has been completed. Many other buildings have been erected, among which is a sawmill with a capacity of 100,000 feet per day, which is ready for the installation of the machinery. A small town—Port Alice—is already in existence, and some 300 men are at present employed by the company. Here is located a good general store and post-office. The C.P.R. steamer "Maquinna," sailing from Victoria, calls three times monthly, and twice weekly a launch makes the trip of twenty miles to Coal Harbour with mail and passengers, where connection is made with Port Hardy over the trail.

The prevailing prices have a stimulating influence on the mining industry, and several camps on the South-east Arm are very active with development-work. Among these are the Yreeka and the Old Sport. As yet none are in a position to ship any large quantity of ore. Some iron ore is found on the West Arm, but it is not being developed at present. Around Coal Harbour are indications of a rather extensive coal area, which has not yet been tested, but which, I under-

stand, is to be tested with a diamond-drill in the near future. This land was taken up on account of the coal as far back as 1865, but beyond a little work done years ago the coal has not been touched.

Around the little town of Quatsino a small area is under cultivation, and garden produce appears to do quite well. But the precipitation of 120 inches a year is too much for many crops.

There is a large amount of timber tributary to Quatsino Sound, a large part of which has been secured for the pulp-mill. The timber consists of fir, cedar, hemlock, and balsam, with a good proportion of merchantable timber, and plenty suitable for the pulp-mill. In many places the timber has been uprooted over large areas by a storm of unusual violence from the south-west. These windfalls are about as impenetrable as one could well imagine; criss-crossed to a depth of often 30 feet and with a very dense second growth and more or less salal, it is a matter of hours to force one's way only half a mile.

We remained on Quatsino Sound until the wet weather set in, when we packed pack to Port Hardy, and returned to Victoria by the east coast.

I have, etc.,

LEROY S. COKELY, B.C.L.S., D.L.S.

MASSET AND SKIDEGATE INLETS, QUEEN CHARLOTTE ISLANDS DISTRICT.

BY J. C. A. LONG.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

October 27th, 1917.

SIR,—I have the honour to submit the following report on my surveys on the Queen Charlotte Islands during the past season under your instructions of July 4th:—

My work took me into various parts of the islands, including some of the earliest-settled districts. The country as a whole has suffered from the general falling-off in population; some districts which had not reached a productive state of development having been abandoned almost entirely, while others that were being profitably cultivated in 1914 have suffered little or no change under the altered conditions of the present. The resources of the islands are being developed on strictly productive lines, and the industries being built up have caused a considerable improvement in the local markets for farm produce of all kinds.

The northern part of Graham Island has suffered as much as any in this respect; though it has the greatest agricultural possibilities of any district on the islands, the settlement through the country was scattered and its development was backward, and the land could not be turned to an immediate state of productiveness, which is the main consideration at the present time.

The greatest disability under which the islands are suffering to-day is the inadequacy and irregularity of the steamship connection with the Mainland, which makes it almost impossible to compete in the Prince Rupert market.

TIMBER.

The timber resources of the islands are being opened up on a large scale at the present time; the heavy demand for spruce (silver) for aeroplane stock, and the rough for box lumber, which work in well together, and for pulp-timber, has brought about extensive logging operations in various parts of the islands.

FISHING.

There is a steady development in this industry, and ample provision is being made for handling the local catch in various parts of the islands. The cannery at Aliford Bay has been taken over by a new syndicate and operated during the past season. A cold-storage plant is being installed on the west coast at Rennell Sound by the Atlin Fisheries; these, together with the cannery at Naden Harbour, a branch of the Wallace Fisheries, and the saltery at Jedway, being well distributed over the fishing-grounds, offer good facilities to fishermen.

KELP.

At Pacofi a plant has been established for the manufacture of potash from kelp. If this industry should be successful it is likely to be extended, as there are many parts of the islands, particularly at the north of Graham Island, where kelp-beds extend for a mile or more from the shore.

Masset District.

The lands surveyed by me in this district lie within three miles of Masset, in the neighbourhood of the mouth of the Hancock River. The object of this survey was to adjust certain differences between prior existing surveys and to complete the survey of this part of Graham Island. The land in this part is heavily timbered with a poor quality of spruce and hemlock and a dense growth of salal and berry bushes. It is not suitable for settlement at the present time, as the clearing would be very heavy and costly and the ground is of a more or less broken nature. This land is covered entirely by timber limits.

Sandspit.

Farming conditions in this district do not appear to be affected to any appreciable extent under the conditions prevailing. There is a good local market for all kinds of produce and the farms all present a prosperous appearance. The country is well suited for dairying, cattle and sheep raising, and the farmers are getting good returns.

Lot 2143 is heavily timbered throughout with a fair quality of black spruce and hemlock. The land is level and its soil a sandy loam, with gravel subsoil, similar to the lots adjacent to it, where good results have been obtained. There are some patches of swamp land of small extent, covered with a dense growth of crab-apple. The soil in these swamps is black muck, which should be very productive if the land is drained. This lot has a frame house, situated near the north-west corner part, and a small clearing of about three-quarters of an acre.

Lot 2144 is level throughout and generally of a swampy character. One swamp, partly meadow land and partly covered with a dense growth of crab-apple and red willow, varying in width from 2 to 5 chains, runs the entire length of the lot from west to east. If drained this land should be very productive. There is some big timber of poor quality, mostly spruce and hemlock, of no commercial value.

Lot 2145 contains a considerable amount of open land of a sandy nature at the north end, which has been fenced and sown to pasture. The south-west corner is heavily timbered with spruce and hemlock. The easterly portion is covered with a dense growth of alder. This lot is level throughout. The soil in the alder-flat is a goody sandy loam.

Lot 2146 is heavily timbered with spruce and hemlock along the water-front and along its west boundary. The lot is level except at the south-west corner, which is up on a steep hillside near the top of the first beach. The main feature of this lot is a swamp extending the entire length of the lot from south to north and varying in width from 3 to 10 chains. It contains a large proportion of swamp-meadow land, and some of it is thickly overgrown with crab-apple and willow. Drainage would be the first requirement before this land could be cultivated, as in the wet season it is almost entirely under water. There is sufficient fall for drainage and an easy outlet could be found. Drainage would undoubtedly make this land very productive. The soil is a deep black muck, with a subsoil of gravel.

Lina Island.

My work here consisted of defining the positions of the boundaries of Crown-granted lands and locating certain corners whose positions were in doubt.

Lina Island has been well settled for some years, the farms being situated round the water-front, mostly on the south side of the island. As the island is hilly, the extent of agricultural land is necessarily small. Most of the land under cultivation is adjacent to the beach, though there are several benches farther back that could be brought under cultivation. The soil on the island consists of a sandy loam, and as the rainfall is sufficient and the lands are well protected from the northerly winds, very good results are obtained in the production of vegetables, grain, and grasses.

South Island.

Lot 2142, surveyed by me on this island, is situated at its eastern extremity and comprises a small limestone peninsula, a good harbour, a level bench of good land with sandy loam soil. The limestone has been tested and found to burn well, giving a good quality of lime. This lime should prove of considerable value to the islands generally, as limestone is not common and lime is required on most of the lands, particularly on Graham Island, when first brought under cultivation. A good shake house and small barn and other buildings have been put up and about 2 acres cleared and sown to pasture or cultivated as a garden.

TLEL RIVER AND HECATE STRAIT.

My work in this district consisted of defining boundaries of lots previously surveyed. Most of the farms through this district seem to be doing well, though a great number of the later settlers have gone away. This district is handicapped by the markets for its produce being so far away, involving a long and extensive haul.

I have, etc.,
J. C. A. LONG, B.C.L.S.

PHOTO-TOPOGRAPHICAL SURVEY IN OKANAGAN VALLEY.

BY R. D. McCAW.

J. E. Umbach, Esq., December 7th, 1917.
Surveyor-General, Victoria, B.C.

SIR,—I beg to report upon the continuation of the photo-topographical survey of the Okanagan Valley, carried on by me during the past season under instructions from you bearing date of June 6th. The intention this season was to complete the survey commenced in the summer of 1914, so that the entire watershed of Okanagan Lake would be mapped from Penticton to Armstrong. The triangulations controlling the surveys are complete, and sufficient camera stations were occupied during the past season to conclude the photographic work, so that if the enlarged photographs are satisfactory the entire field-work is now done. This can only be decided as the map-work progresses.

Unfortunately the type of camera used previously could not be obtained for this season's work. Dr. Deville, Surveyor-General of Dominion Lands, who had loaned a camera for these surveys in 1914, 1915, and 1916, could not spare one this year. However, two cameras and one transit belonging to the photo-topographical outfit used on the Alaskan Boundary survey were loaned by Mr. J. J. McArthur, International Boundary Commissioner of the Dominion Astronomical Observatory, Ottawa. The construction and manipulation of these cameras was not as good as in the camera loaned previously by Dr. Deville, but it is hoped that results sufficiently accurate will be obtained.

Before leaving Victoria the cameras were tested and fittings made, so that two complete outfits were available for field use. After leaving Victoria the usual preliminary arrangements as regards men and outfits were attended to at Vernon and Kelowna. Active field-work was commenced with a full party on June 14th. The type of man required for this class of work was more difficult to find this past season on account of the scarcity of labour. The daily routine of the field party is strenuous and men of good physical endurance are required, and while the party as a whole was not up to the standard of previous years, the work was carried on as vigorously as possible.

TRIANGULATIONS AND PHOTOGRAPHIC WORK.

The triangulation carried on was similar to that of former years and was a continuation of the general system. Several new stations of the Geological Survey of Canada were occupied. Reverse readings in the case of secondary triangles were not taken as often as formerly, as time would not always permit of the second occupation of a station. The primary system was read carefully and forms a good control for the area to be mapped. Brent Mountain, a primary station of 1914, was occupied again and tied in by a new series of larger triangles. The closure was very accurate. A good number of connections were made to land-survey monuments and to signals left on surveys by the Water Rights Branch. All of this information is valuable for the map-work in hand.

Photographic work and triangulations were run simultaneously, and when possible two camera parties operated on different hills on the same day. Smoke from forest fires and hazy atmospheric conditions were a great hindrance from the middle of July until the end of the season, and many views are very poor on this account. Some of the enlarged photographs for mapping have been received from Ottawa, where the work of developing and enlarging is being supervised by Dr. Deville. The views as a whole are not as good as in former years, and it is difficult to arrive at a reason, as in many cases plates that have been exposed on a clear, bright day, and should give sharp enlargements, are hazy. About 69 dozen dry plates were used, including test-plates.

Season's Operations.

The work on Peachland (Deep) Creek was commenced on June 18th, a couple of stations being occupied prior to this near Kelowna and on Squally Point. The surveys were carried up Peachland Creek to the forks, and then up the South Fork to the reservoir at the head of that branch. This reservoir is retained by a small dam which it is thought could be enlarged to increase the capacity of the reservoir. South of Peachland Creek, stations were selected to connect with the surveys of 1914 in that vicinity. The creek is usually deep down in a canyon-like ravine, with sides in places rising abruptly for 200 feet. A fairly good road has been constructed from Peachland to the South Fork reservoir and a little beyond it, a distance of about seventeen miles. A considerable area along the valley has been pre-empted, but in the upper twelve miles it is all vacant at present. Generally this area is well timbered, but much is dying. North of the creek in the yellow-pine belt, in one area nearly every yellow pine is dead. Farther up the creek much of the more mature jack-pine has died also. From information gathered this condition is caused by some insect.

From the South Fork reservoir we moved to Trout Creek near Thirsk, a station on the Kettle Valley Railway. Surveys were carried south-easterly from Mazama (Princeton Crossing) to Kirton and connection made with the work of 1914. The old tote-road used in the construction of the railway is used by the few settlers in the valley. Some of the bridges crossing Trout Creek are in a bad state, but with repairs the road would be in first-class shape as a connecting highway between Summerland and Princeton. From Kirton to Mazama the valley has a good width of bottom land. About a mile below Kirton the creek enters a canyon which continues on towards the open country back of Summerland. During this part of the work several side-trips were made from the main valley into tributary valleys. Canyon Creek was followed to its headwaters. A fairly good trail has been built to a small reservoir at the headwaters by the Municipality of Summerland. It would seem that the capacity of this reservoir could be much increased by locating a dam about a mile below the present small structure. This statement is made from observation only, but a few levels would soon give the required data. While in this locality a trip was made to Brent Mountain, upon which is a primary station of 1914. Further angles were observed and a connection made to the boundary between the Kamloops and Similkameen Districts. This mountain is of considerable mass and sheds water to Shatford and Shingle Creeks, and through tributaries to Trout Creek. Between Canyon Creek and Osprey Lake some four or five streams are tributary to Trout Creek. The headwaters are found in swamps or marshes.

Smoke from forest fires began to interfere with operations from July 15th, and this condition continued more or less until October, the summer and fall being very dry.

The timber on the north side of Trout Creek between Mazama and Kirton has been logged off to a considerable extent, and logging operations were being carried on near Thirsk during the past summer by the Penticton Lumber Company. At Altamont, De Muth's sawmill was in operation, although but a few men were employed. Fire has done much damage in years gone by, more particularly on the higher slopes, but large areas of timber have grown up again; some areas are but partially grown, and the top of Brent Mountain, at one time timber-covered, is bare.

Near Mazama, Trout Creek bends sharply and the valley to the north of the Kettle Valley Railway has a course almost north and south. About five or six miles north of the railway the creek forks, one branch flowing from the west and another from the north-east. At the head of the latter are reservoirs controlled by the Municipality of Summerland. Surveys were carried northerly and westerly, and the watershed of the Okanagan Valley located at the headwaters of the westerly fork near Whitehead Lake and Penask or Culmination Mountain. Whitehead Lake has been surveyed by the Water Rights Branch as a possible reservoir-site. A primary triangulation station was occupied on the summit of Kathleen Mountain east of Trout Creek. The point used is a station of the Geological Survey of Canada. The branch of Trout Creek from the north-east flows for the greater part through large beaver-swamps. From Trout Creek over to the North Fork of Peachland Creek an undulating valley is passed through, containing a number of small lakes in addition to the Summerland reservoir. Unfortunately much of the area has been damaged by fire and portions are open. A good pack-trail extends from Mazama to the Summerland reservoir and continues northerly to the reservoir on Peach-

land (Deep) Creek; a trail branches off near this reservoir and leads over the divide to Penask Lake, in the Nicola country.

From the Peachland reservoir on the North Fork of Peachland Creek surveys were extended westerly to the headwaters, several camera and triangulation stations being occupied on the divide separating the Okanagan and Nicola Valleys. One station was occupied on a spur of Penask Mountain. A branch of Penask Creek which rises on this mountain has been diverted into Peachland Creek. Brenda Lake, at the head of another branch of Penask Creek, will also probably be diverted into Peachland Creek. The scarcity of water for irrigation during the past season has led to investigations in this locality for new sources. Again in this locality large areas have been burned over.

Trepanier Creek was the next base of operations, and work was commenced on the lower part before the middle of August. The creek forks about eleven miles back from Okanagan Lake, the two branches partially encircling Gottfriedsen Mountain. This mountain mass is a well-timbered feature, and, untouched by fire in many years, forms a splendid watershed area. The summit is on the Okanagan-Nicola Divide. The South Fork of Trepanier Creek flows westerly through a deep canyon south of Gottfriedsen Mountain. The North Fork has its source at the north end of the mountain, and flows first easterly and then southerly through a deep canyon also. A deep lake is situated close to the head of the canyon of the North Fork. It was thought that this lake drained to Trepanier Creek, but closer examination gave the information that it drained to the Nicola River. It is possible that a diversion might be made to Trepanier Creek. There are two other tributaries of Trepanier Creek worthy of mention—namely, McDonald Creek from the south near the forks, and Jack Creek from the north, joining the main stream nearer Okanagan Lake. A wagon-road extends up Trepanier Creek for about six miles and a good trail then leads to the forks. The trail continues westerly over the side of Gottfriedsen Mountain to the Nicola Valley. This portion is in bad condition for travelling.

Powers Creek is the next main stream to the north of Trepanier Creek, and enters Okanagan Lake at Gellatly's Point, south of West Bank. The West Bank Settlement covers a considerable area on the lower reach of the stream and is badly in need of a more efficient system of irrigation. Surveys were carried westerly to the headwaters of the main branch of Powers Creek, where are located several small lakes at present undeveloped as storage-reservoirs. Two tributaries, known as the North and South Forks, join the main stream at about twelve and fourteen miles back from Okanagan Lake. The South Fork heads in a small body of water known locally as Fish Lake. It is undeveloped as a reservoir. The North Fork has its source in swamps. The main stream from the junction of the North Fork flows through a rough rocky canyon towards the West Bank area. While in the vicinity of the lakes at the headwaters of the main stream an exploratory trip was made westerly to an upper branch of the Nicola River. This branch comes from swamps in a well-timbered area to the north, and by means of a ditch could be diverted into one of the lakes, thus increasing the amount of water available. A good pack-trail has been built from the end of the wagon-road to connect with the lakes just mentioned, and for our own use we cut a trail westerly connecting with a trail from Bear Creek to the Nicola River. The upper portion of Powers Creek is well timbered, but in some areas between Trepanier Creek and Powers Creek, in the vicinity of the lake on the South Fork, the timber is dying, a large area of such showing red.

About the middle of September we moved northerly to Bear Creek. This stream with its various tributaries has been well traversed by F. R. Johnson, B.C.L.S. The positions are of value in plotting the topography of the present work. Swamps and marshes form the headwaters of the branches, while a small lake is tributary to the South Fork. In moving camp from Powers Creek we cleared out an old trail, and cut a new one to this lake and connected with the existing trail down the South Fork. This trail joins the wagon-road up the main stream about six miles from Okanagan Lake. The upper portion of the watershed is well timbered, while lower down there is much splendid open range land. During the past winter logging operations were carried on north of the creek on the lower part and a great deal of yellow pine removed. There still exists much good timber on this side for a distance of seven or eight miles from the lake. Terrace Mountain to the north is on the divide between Bear Creek and Short's Creek. Last year a triangulation station was established on the summit of this mountain. A few settlers are living on the lower part of Bear Creek, but the upper pre-emptions are vacant.

Triangulation-work was commenced on Short's Creek at the end of September. The valley of this stream is entirely different to any other in the Okanagan Valley. For the greater part of its length the creek flows through a most mountainous valley, with very steep, rocky sides, in places about 2,000 feet high, and fissured and chimneyed in a manner similar to the higher mountains of the Rockies. Coal-deposits exist in the valley at a fairly high altitude, but are undeveloped at present. A road extends along the bottom from Okanagan Lake for a distance of about four or five miles, and then a trail goes on for another six or seven miles. A trail also branches from the road and leads up to Terrace Mountain.

Whitemans Creek, the next main stream to the north, has a deep-cut valley with precipitous sides. It flows through a well-wooded area rising in swamps that are well protected by thick timber. Boulean Creek, which is really the North Fork of Whitemans Creek, joins the latter about four miles from the outlet into Okanagan Lake. At the head of this stream is Boulean Lake, an extremely picturesque mountain lake, which is between two and three miles in length and entirely surrounded by green timber. About half a mile west of the lake and in the same valley the headwaters of the Salmon River are located. Tahaetkun (Baldy) Mountain was one of the main stations in this locality. The summit is situated between branches of the Salmon and Nicola Rivers. The east end of the ridge is on the west divide of the Okanagan Valley. It might here be stated that this locality is very representative of volcanic or igneous action. The rock assumes many different colours, a bright red being very common. Many particles of rock of an opalescent nature were found, also particles of variously streaked agate. One specimen picked up was in the form of a small pocket containing quartz crystals of a faint purple shade. An old trail follows the top of the ravine north of Boulean Creek from a logging-road near the forks, and extends to Boulean Lake. It is in a very bad state of repair and much work was necessary before we could use it.

Surveys were next carried up Equesis (Six-mile) Creek, the last large stream on the west side of Okanagan Lake. As it was now getting late in October, work had to be rushed to the extreme limit. Fortunately there had been no snow in sufficient amount to stop operations. Pinaoos Lake is situated near the summit of the divide between Equesis Creek and a stream flowing to the Salmon River, and is just south of the south limit of the Dominion Railway Belt. A connection was made to one of the section corners on this boundary. A station of the Geological Survey south of Equesis Creek was occupied as a triangulation and camera station. A small stream lies between Equesis and Whitemans Creeks, with source in swamps on the plateau between those streams. Equesis Creek has a fair area of bottom land and pre-emptions have been taken up for some distance, but are at present vacant. A good road extends westerly for about five or six miles from Okanagan Lake, and a good pack-trail goes on to Pinaoos Lake and over to Grande Prairie.

The first heavy snow came on October 26th and further work in higher altitudes became impracticable. Fortunately the high stations were now complete, with the exception of two which I had wished to occupy. It is possible these will not be necessary, but should they be required they can be easily reached next summer. The exceptional weather in October alone made it possible to continue past Whitemans Creek.

On October 27th camp was moved to Irish Creek and camera stations occupied in the vicinity of the valley leading from Vernon to Salmon River. This is an open area and well settled. The soil is good and very productive. Snow fell again on October 28th, and reached down to Okanagan Lake, so further camera-work was out of the question. However, it is considered that sufficient stations were taken to complete the work in this vicinity. The party was then disbanded, and according to your instructions the horses were sold, the pack outfit given over to the District Forester, and the camp equipment stored with the Government Agent at Vernon.

During the season the camp was moved in whole or in part forty-nine times, covering a total distance of about 370 miles. When possible on a moving-day one camera would be operated. Much time was saved by this procedure, although it often meant a very hard day for the camera party. Eight days were lost on account of smoky atmosphere and five days on account of rain.

Number of primary stations occupied or used	8
„ secondary stations occupied or used	8
„ photographic stations occupied	113
„ separate camera stations	217

Numerous connections were made to land surveys and water-rights surveys.

GENERAL.

The past season had less rainfall than any of the other summers spent upon this work, and as a result forest fires were much in evidence. More or less smoke from these was continually clouding the atmosphere, but unless it was very thick we went on with the camera-work. Views were taken many times when it would have been better to have waited, but the area to be covered was large and the situation had to be accepted. Two large fires caused much damage to timber, one south of Penticton and another east of Long Lake. Small fires near the headwaters of Trout Creek caused great inconvenience while we were in that vicinity.

Many of the fruit-growers, especially at Peachland, Naramata, and Kelowna, were deploring the lack of sufficient water for irrigation, yet from the Okanagan Valley as a whole the export of fruit and other farm products seems to be greater than ever before. The question of labour was difficult, and wages as a rule were much higher than in former years.

The game on the west side is very similar to the east side of the lake. Deer seem to be plentiful back from the lake, while some sheep may be seen in the vicinity of Short's Creek Canyon. Black bears are in evidence, but do not seem to be very numerous. Mountain-lions have been seen and trapped in the more remote regions. Grouse are not very plentiful. Beaver may be found at some of the headwater swamps. Most of the streams are stocked with small trout and the lakes generally contain the larger variety.

The work of mapping the area surveyed is now in progress, and on account of the large area covered (about 900 square miles) several sheets will be submitted. Triangulation and timber plans will accompany the topographical sheets. As mentioned in previous reports, the office-work is slow and tedious and will require a considerable time for completion.

A few photographs will be submitted later when all of the plates are returned from Ottawa.

I have, etc.,

R. D. McCAW, B.C.L.S.

SURVEY OF THE BOUNDARY BETWEEN THE PROVINCES OF ALBERTA AND BRITISH COLUMBIA.

BY ARTHUR O. WHEELER.

December 17th, 1917.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—The season of 1916 completed the survey of the boundary between the Provinces of Alberta and British Columbia from the International Boundary to the main line of the Canadian Pacific Railway through Kicking Horse Pass.

In 1917 the survey was carried on north of the railway, Mr. R. W. Cautley representing the Dominion and Alberta Governments and Mr. A. O. Wheeler the Government of British Columbia. The methods employed were the same as in previous years, and the necessary instruments for carrying on the work were, as heretofore, loaned to the Commission by the Surveyor-General of Dominion Lands.

INSTRUCTIONS.

Information received from the Surveyor-General of Dominion Lands in March, 1917, notified the Commissioners that the demarcation of the Interprovincial Boundary was urgently needed at Yellowhead Pass and in the Peace River District, where considerable settlement has taken place on both sides of the boundary. The Surveyor-General stated that he was making arrangements for the telegraphic determination of longitude 120° on Peace River, the 120th meridian of longitude there defining the boundary between the two Provinces.

Subsequent correspondence made it apparent that the longitude in question could not be established in sufficient time to make the Peace River survey during the season of 1917. It is now understood that this longitude has been established during the past summer under the direction of the Surveyor-General of Dominion Lands.

In consequence, it was decided to first complete the survey of Howse Pass before proceeding with the Yellowhead Pass survey; and, finally, if time permitted, to survey Tonquin Pass, eleven miles to the south of Yellowhead Pass.

Scope of Work.

North of the Canadian Pacific Railway the first practical pass over the continental watershed is Howse Pass, situated approximately some fifty miles from it following the line of the watershed.

Previous photo-topographical surveys, made by A. O. Wheeler in 1903-1905, inclusive, between the Canadian Pacific Railway and the north limit of the Railway Belt, as well as in adjacent territory on the east side of the watershed, left only a small part of the watershed between the Railway Belt limit and Howse Pass to be surveyed. It was thus possible for both divisions of the survey to go direct to Howse Pass and begin work there.

The late opening of spring in the mountains, snow lying on the passes, prevented Mr. Cautley's division from arriving at Howse Pass until the latter end of June. His party travelled there from Field, B.C., by way of the Emerald Lake Road and the trail branching from it to Amiskwi River Valley; then by trail up that stream and over Amiskwi Pass to the valley of Blaeberry River, and up the valley to Howse Pass. Mr. Cautley found it necessary to dig a path through the snow over Amiskwi Pass. The topographical division, following him a week later by the same route, arrived at Howse Pass on July 1st.

Work there and in the vicinity was completed by the end of July, when both divisions travelled by pack-train, following the Saskatchewan and Athabaska River Valleys, to Jasper, on the Grand Trunk Pacific Railway, and thence to Yellowhead Pass by way of the Miette River Valley. The topographical division arrived at Jasper on August 13th, Mr. Cautley's division having reached that place three or four days earlier. The trip across takes from ten to twelve days, according to the weather encountered; on this occasion heavy rain-storms delayed progress.

The distance from Jasper to Yellowhead Pass is eighteen miles of very indifferent travelling by trail and a broken-down tote-road, and required two days of travel with pack-train. Mr. Cautley camped at the Yellowhead Pass Summit, while my division went five miles farther on to near the village of Lucerne, on the British Columbia side.

The remainder of the season was spent monumenting the pass and in surveying the watershed and its vicinity both north and south of it. The topographical division closed work on September 12th and returned to Jasper on the 14th. On September 15th the party started for Lake Louise Station by trail across the mountains, and arrived there on the 26th. Mr. Cautley's division did not complete the monumenting of Yellowhead Pass until the middle of October.

Howse Pass.

The altitude of the summit of Howse Pass is computed by the topographical division to be 5,010 feet above sea-level. It lies in a deep, trough-like valley enclosed by densely timbered mountain-slopes. The valley-floor is flat, fairly open, and about half a mile wide; the sides are very steep and broken, and from crest to crest the valley is about three and a third miles across. The approach on the British Columbia side is long and gradual up the Blaeberry Valley; on the Alberta side of the watershed the wide gravel-bed of a branch of the Saskatchewan River lies only an eighth of a mile beyond the summit of the pass.

The total length of line surveyed from crest to crest is 4.2 miles, necessitating the placing of eleven monuments. Seven of these are built of concrete, and the remaining four are brass bolts, cemented in rock, with stone cairns erected over them. The dense growth of spruce and fir on the sides of the valley made it necessary to cut out trails in order to pack cement and gravel to the sites of the several monuments.

While Mr. Cautley surveyed the boundary across the pass and built the concrete monuments, the topographical division placed the brass bolts and built cairns over them, and occupied a sufficient number of camera stations to supply data for mapping the pass summit and to cover the country contiguous to the watershed on the Blaeberry side as far south as the north limit of the Railway Belt; also for a considerable distance north of the pass on the Alberta side of the watershed. In this section twelve camera stations were occupied.

Mistaya River Valley.

Work at Howse Pass completed, the topographical division proceeded down the Middle Branch of Saskatchewan River to its junction with the North Branch, and then up the valley of Mistaya River, where a number of camera stations were occupied to enable the country

adjacent to the watershed on the Alberta side to be mapped and to link up such survey with that previously made as far as the north limit of the Railway Belt at Bow Pass, the divide between the waters flowing south in the Bow River and north in Mistaya River to the Saskatchewan. Three camera stations were occupied along the eastern side of the valley and one at the summit of Bow Pass while on the way home in September.

YELLOWHEAD PASS.

The Yellowhead Pass survey was of a more extended and more difficult character. The altitude of the summit is 3,716 feet above sea-level, according to the Grand Trunk Pacific Railway levels at the highest point of its road-bed. The Grand Trunk Pacific Railway and the Canadian Northern Railway here lie side by side with the road-bed of the latter, some 10 feet lower. For several miles on either side the surface is densely timbered with pine and spruce of small dimensions, a considerable area of which has been burned over.

The floor of the pass at the summit is narrow, less than 10 chains. On the north side of the watershed the ground rises swiftly to near timber-line, when it follows the crest of a long plateau-like ridge to the base of the eastern terminal bluff of Yellowhead Mountain, on the summit of which is the monument marking the northern limit of the survey across the pass. On the south side the watershed-line winds unevenly over very rough ground for about two miles, and then rises in steep steps to the crest of a long ridge, which it follows to the limestone hills bordering the valley on the south. The direct distance from crest to crest is 8.3 miles, but the windings of the watershed increased the distance to 11.8 miles of line.

Thirty-two concrete monuments were built by Mr. Cautley's division, which required the packing of cement and gravel from the pass summit to both extremities of the portion of the boundary established across the pass, and to an elevation of more than 2,000 feet above it. To do this it was necessary to cut out pack-trails through the dense timber to the more open country above. In addition, five brass bolts were set in place and rock cairns erected over them.

The topographical division occupied a sufficient number of camera stations to map the pass summit and the country adjacent to it, and then extended the survey southward along the watershed for about ten miles and northward for about the same distance. For such purpose eighteen camera stations were occupied. The country is little travelled over by prospectors and hunters, and pack-trails had to be opened up to give access to the various stations occupied, entailing a considerable expenditure of time.

GENERAL.

Howse Pass is of low altitude, lower than the Kicking Horse Pass, through which the Canadian Pacific Railway crosses the main divide of the Rocky Mountains. At one time it was under consideration for the location of the said railway, and surveys were made with that object in view. There is a lot of spruce and fir timber, valuable for commercial purposes, directly at the summit of the pass and along the sides of the valley of Blaeberry River, flowing south and west to the Columbia. Timber limits have been taken up here, but the getting-out of the timber would be a difficult and expensive process, probably requiring a railway to connect with the main stream of Blaeberry River. On the Alberta side of the watershed the timber is of small dimensions and consists chiefly of pine and spruce.

The distance from Lake Louise Station, on the Canadian Pacific Railway, via the valleys of the Bow, Saskatchewan, Sun Wapta, and Athabaska Rivers, to Jasper Station, on the Grand Trunk Pacific Railway, is estimated at 165 miles. The trail passes through many large bodies of timber, and is gradually being improved by means of work done by the Dominion Government Forestry Branch, with a view to organizing an effective fire patrol. Taken as a whole, the trail throughout is a very passable one, lying for many miles of its course over broad shingle-flats where the Saskatchewan, Sun Wapta, and Athabaska Rivers spread out in innumerable channels. There are necessarily, in such a long distance, many places where travel is very rough and difficult, and fallen timber and marsh land furnish serious obstacles, but it does not seem impossible that a good road could be constructed from steel to steel that would furnish a route over which the mountain scenic splendours, and they are truly wonderful, would attract crowds of tourists, and thus be the source of very considerable revenue to the country when the time is ripe.

In Yellowhead Pass and vicinity there are, as is always found to be the case after railway-construction, large tracts of burned timber. The existing green timber is of rather small dimensions, pine and spruce, and on the British Columbia side some fir.

Yellowhead Lake, two miles and a half below the summit of the pass on the British Columbia side, is a very beautiful and irregular sheet of water. Near its lower end is the village of Lucerne, where the Canadian Northern Railway has a divisional point. The railway lies along the southern margin of the lake and the Grand Trunk Pacific Railway along the northern margin, the two sides being connected by a bridge across a narrows in the lake. At present only the road-bed of the Canadian Northern is in use, the steel rails of the Grand Trunk Pacific having been removed and sent to France for war service. The stream flowing from the lower end of the lake joins the Fraser River within a mile.

GAME AND FISH.

The usual varieties of game were apparent, although few species were seen. Mountain-goat are high up on the peaks; mountain-sheep, the big horn, are on the headwaters of the Saskatchewan and Athabaska Rivers; small deer are in all the woods, and in the vicinity of Yellowhead Pass moose were seen and signs of caribou. Beaver were in the marshy ponds and along the streams; the usual species of woodland grouse were frequently met with, and ptarmigan were seen high above the timber. Tracks of bear were often noticed, and a cougar (mountain-lion) was encountered by a member of the survey party.

Fish are scarce. There are a few trout in the streams on the Alberta side, and a few fish, probably char, in Yellowhead Lake, but of small size.

SURVEY RETURNS.

Maps, field-notes, and a full detailed report are now being prepared, and will, when ready, be submitted to the Surveyor-General of Dominion Lands.

I have, etc.,

ARTHUR O. WHEELER, B.C.L.S.,
International Boundary Commissioner.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

PROVINCE OF BRITISH COLUMBIA

REPORT

OF

THE FOREST BRANCH

OF THE

DEPARTMENT OF LANDS

HON. T. D. PATTULLO, Minister

M. A. GRAINGER, Chief Forester

FOR THE YEAR ENDING DECEMBER 31ST

1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

VICTORIA, B.C., March, 1918.

To His Honour Sir FRANK STILLMAN BARNARD, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of the Forest Branch of my Department for the year 1917.

T. D. PATTULLO,

Minister of Lands.

The Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—Owing to heavy enlistment among the staff and the pressure of current work (especially in connection with the speeding-up of aeroplane-spruce production), it has not been possible to furnish the usual literary comment upon the events of the past year. There are submitted herewith statistical tables covering the main activities of the Branch during the calendar year 1917.

M. A. GRAINGER,
Chief Forester.

REPORT OF THE FOREST BRANCH,
DEPARTMENT OF LANDS.

THE TIMBER INDUSTRY.

The final figures for the cut of the Province for 1916, compiled from returns supplied to the Forest Branch by the industry, are as follows:—

	Feet B.M.
Lumber	890,000,000
Shingles, 1,900,000 M.	190,000,000
Poles, 2,500,000 lineal feet	12,500,000
Piles, 2,200,000 lineal feet	11,000,000
Hewn ties, 1,000,000 ties	30,000,000
Fence-posts, 25,500 cords	12,750,000
Mining-props, 31,000 cords	15,500,000
Total	1,161,750,000
Total production reported, 1915	991,780,200
Total production reported, 1916	1,161,750,000

ESTIMATED VALUE OF PRODUCTION.

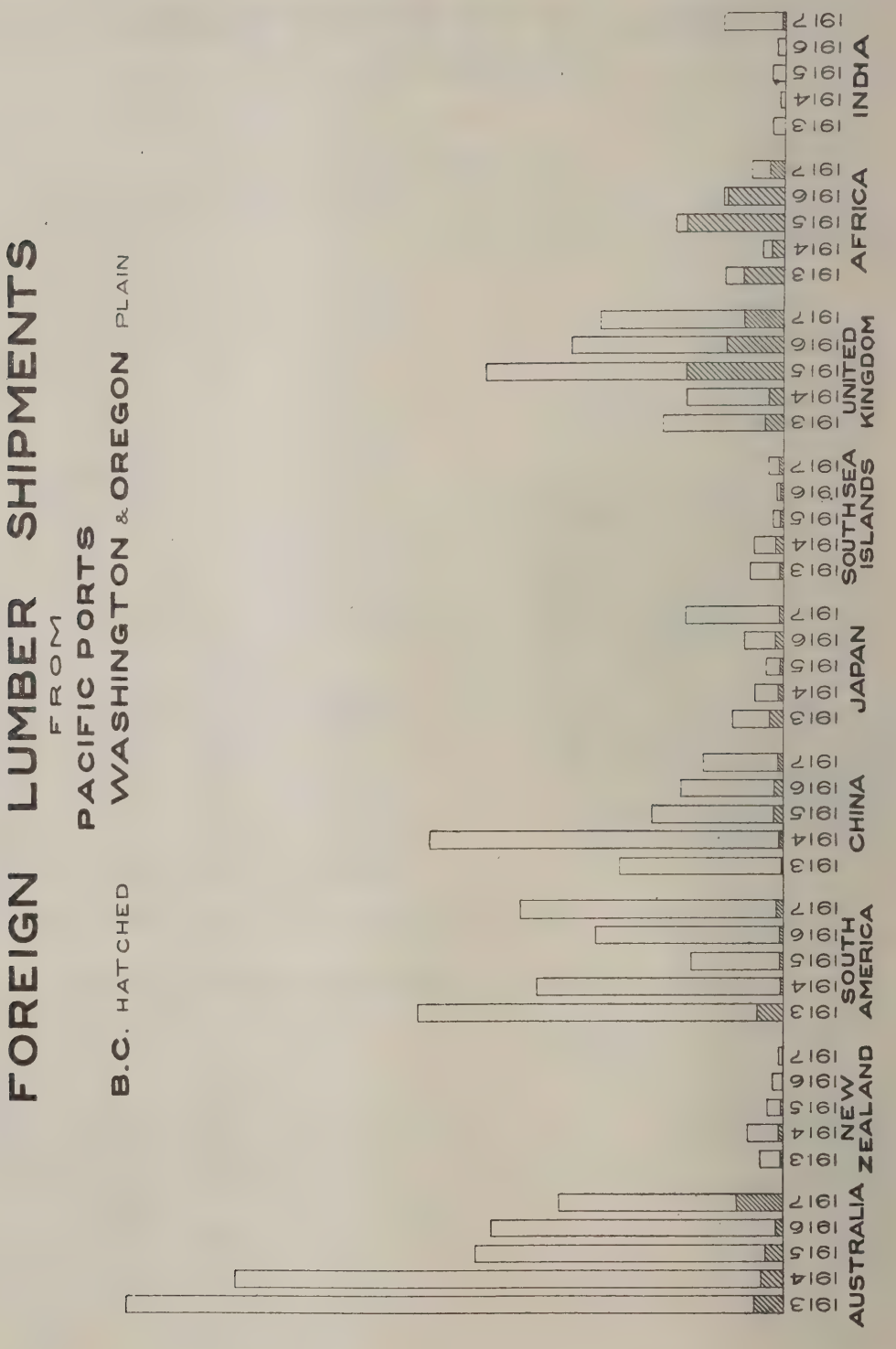
(These figures include transportation within the Province.)

Product.	1914.	1915.	1916.	1917.
Lumber, Coast	$15,500,000*	$15,500,000†	$21,075,000†	$28,225,000†
Lumber, Interior	3,750,000	....	....	....
Pulp	2,730,000	3,200,000	3,520,000	6,835,034
Shingles	650,000‡	3,500,000	4,500,000	6,900,000
Boxes	....	750,000	1,833,000	1,611,880
Piles and poles	900,000	1,200,000	650,000	467,695
Mining-props and posts	300,000	400,000	1,000,000	546,883
Miscellaneous (cut by railroads, mines, etc.)	1,200,000	900,000	1,150,000	1,425,815
Additional value constituted by the industry	1,900,000	1,750,000	1,650,000	2,145,880
Product of Dominion lands	1,600,000	1,800,000	....§	....§
Laths	150,000	150,000	150,000	142,282
Totals	$28,680,000	$29,150,000	$35,528,000	$48,300,469

* Includes shingles cut from logs. † Includes figures from Coast and Interior. ‡ Includes shingles cut from bolts only.
§ Included in other items.

WATER-BORNE EXPORT OF LUMBER FROM BRITISH COLUMBIA.

Destination.	1915.	1916.	1917.
Australia	5,913,020	2,152,657	16,309,307
New Zealand	640,577	286,421	122,984
West Coast of South America	301,449	627,418	2,616,652
China	3,425,953	3,055,045	1,672,871
Japan	1,583,437	3,042,690	1,590,246
South Sea Islands	1,395,058	991,308	1,610,715
United Kingdom and Continent	38,112,299	19,801,629	13,447,946
Africa	5,329,042	10,114,885	5,022,828
Alaska	....	3,564,654	....
Russia	....	39,816	....
California	1,373,938	....	....
India	....	....	1,529,014
Totals	58,074,773	43,676,523	43,922,563

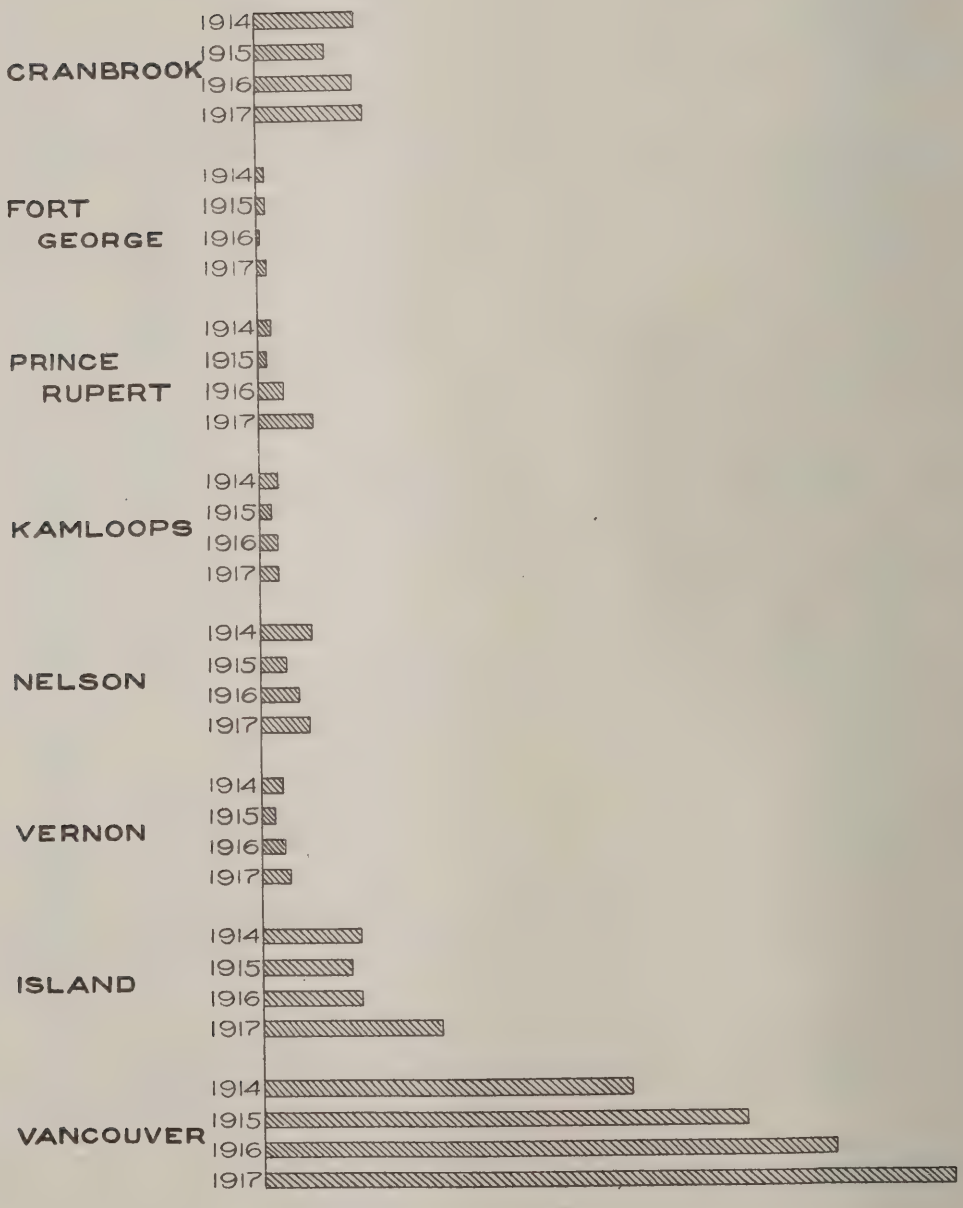

FOREIGN LUMBER SHIPMENTS
FROM
PACIFIC PORTS
WASHINGTON & OREGON
B.C. HATCHED
PLAIN
AUSTRALIA
NEW ZEALAND
SOUTH AMERICA
CHINA
JAPAN
SOUTH SEA ISLANDS
UNITED KINGDOM
AFRICA
INDIA
1913
1914
1915
1916
1917

TIMBER SCALED, 1917 (BY MONTHS AND DISTRICTS).

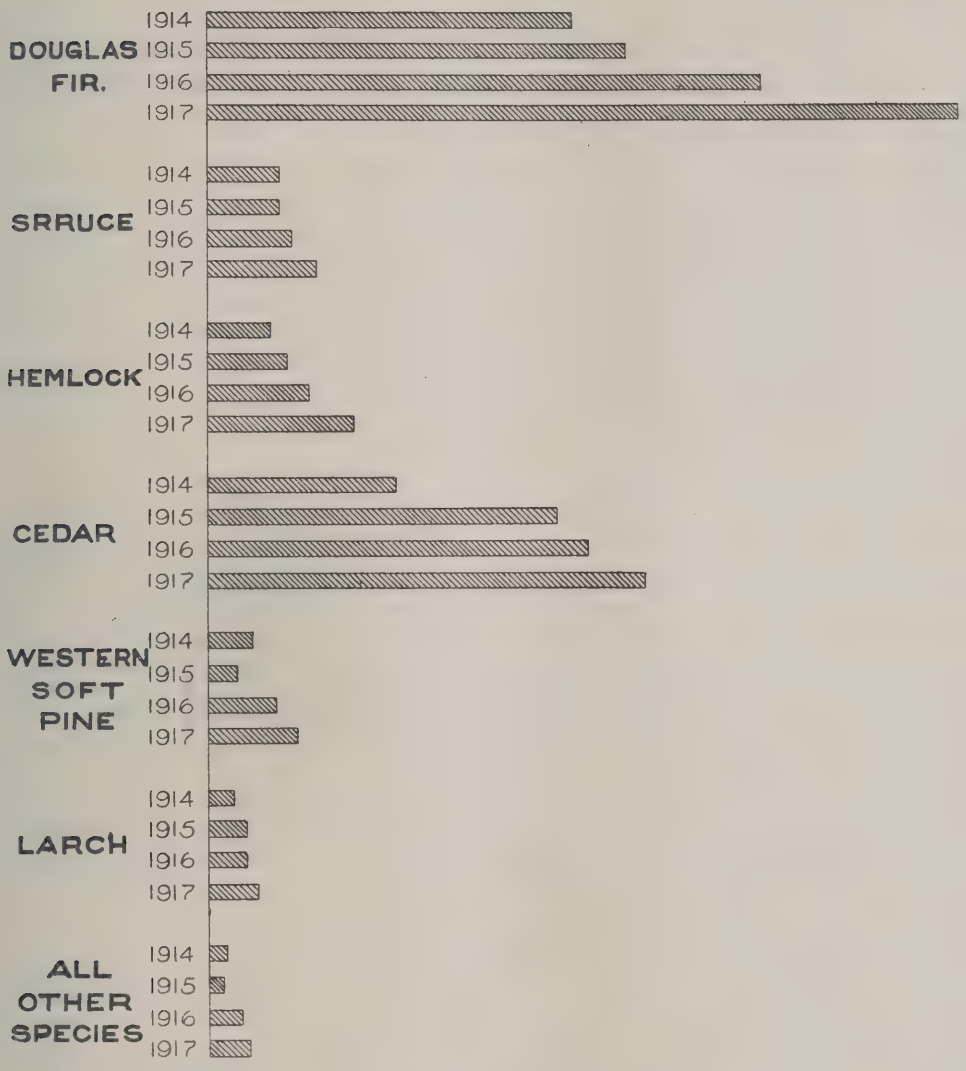
		Cranbrook.	Fort George.	Hazelton.	Kamloops.	Lillooet.	Nelson.	Vernon.	Island.	Prince Rupert.	Vancouver.	Total M.B.M.	Total Lineal Feet, Thds.	Total Cords.	Total Ties.
January	logs, M.B.M.	8,967	102	174	....	75	2,139	731	17,319	1,275	49,670	80,452	....	....	....
"	lineal ft., thds.	5	....	....	....	9	71	27	32	6	35	....	185	....	....
"	cords	5,604	677	28	80	....	3,384	....	1,280	....	24,981	....	....	36,034	....
"	ties	1,835	2,490	....	....	10,000	231	....	....	....	1,004	....	....	....	15,560
February	logs, M.B.M.	7,366	302	164	189	....	581	843	4,386	273	33,923	48,027	....	....	....
"	lineal ft., thds.	22	....	....	17	....	86	11	3	15	115	....	269	....	....
"	cords	6,842	88	14	208	40	2,536	....	....	....	17,316	....	....	27,044	....
"	ties	486	....	....	....	....	446	....	....	....	....	....	....	....	932
March	logs, M.B.M.	7,055	398	191	....	41	2,149	1,447	13,259	1,178	49,476	75,194	....	....	....
"	lineal ft., thds.	15	....	....	10	....	88	28	7	110	75	....	333	....	....
"	cords	5,409	29	32	120	....	1,183	422	....	1,390	6,876	....	....	15,461	....
"	ties	....	....	....	....	36,190	17,466	3,762	....	....	6,700	....	....	....	64,118
April	logs, M.B.M.	8,206	773	170	411	....	716	4,209	12,501	1,003	61,658	89,647	....	....	....
"	lineal ft., thds.	21	....	64	3	....	36	22	29	62	130	....	367	....	....
"	cords	8,789	16	54	....	30	2,001	....	9,550	....	19,416	....	....	39,856	....
"	ties	1,884	....	....	25,270	....	911	1,784	....	....	2,539	....	....	....	32,388
May	logs, M.B.M.	12,662	838	494	494	8	2,850	7,601	20,951	3,925	90,142	139,471	....	....	....
"	lineal ft., thds.	148	....	....	25	....	46	11	81	70	192	....	573	....	....
"	cords	3,529	43	....	250	24	1,596	....	276	....	14,026	....	....	19,744	....
"	ties	99,287	5,796	....	18,041	....	3,733	....	....	....	....	....	....	....	126,857
June	logs, M.B.M.	12,371	391	....	3,169	63	2,903	3,923	17,818	10,607	77,113	128,358	....	....	....
"	lineal ft., thds.	82	....	....	....	....	508	48	22	39	122	....	821	....	....
"	cords	1,296	12	....	369	38	1,273	1,858	194	83	15,716	....	....	20,839	....
"	ties	47,051	....	....	....	....	1,775	345	....	....	....	....	....	....	49,171
July	logs, M.B.M.	14,127	606	....	5,491	77	8,834	297	16,168	9,515	66,345	121,460	....	....	....
"	lineal ft., thds.	37	....	....	9	....	278	15	37	164	218	....	758	....	....
"	cords	5,389	42	....	453	....	4,731	....	161	428	36,373	....	....	47,577	....
"	ties	45,075	....	....	15,926	....	8,564	....	....	....	801,966	....	....	....	871,581
August	logs, M.B.M.	15,399	512	....	3,752	23	5,913	8,545	19,771	14,806	84,433	153,154	....	....	....
"	lineal ft., thds.	52	....	....	16	....	228	13	54	17	148	....	528	....	....
"	cords	1,923	42	....	441	9	2,268	150	239	455	18,327	....	....	23,854	....
"	ties	3,099	....	....	2,375	....	6,333	....	....	....	1,796	....	....	....	13,603
September	logs, M.B.M.	6,721	844	....	3,261	....	3,189	4,339	12,936	10,717	79,372	121,379	....	....	....
"	lineal ft., thds.	20	....	....	....	....	315	68	....	75	95	....	573	....	....
"	cords	808	38	....	355	....	1,094	....	54	745	9,167	....	....	12,261	....
"	ties	43,644	600	....	....	....	5,005	....	....	....	290	....	....	....	49,539
October	logs, M.B.M.	9,850	3,252	....	4,705	25	3,801	3,050	28,034	6,048	88,435	147,200	....	....	....
"	lineal ft., thds.	55	....	....	40	....	282	17	26	6	249	....	675	....	....
"	cords	896	400	....	....	30	1,059	....	900	....	28,397	....	....	31,682	....
"	ties	20,806	14,073	....	....	....	7,860	....	....	77,157	9,756	....	....	....	129,652
November	logs, M.B.M.	9,303	1,038	....	266	....	4,389	1,276	47,842	5,593	62,121	131,828	....	....	....
"	lineal ft., thds.	26	....	....	....	....	255	21	3	7	63	....	375	....	....
"	cords	1,867	....	....	383	....	1,741	....	7,876	15	7,280	....	....	19,162	....
"	ties	27,223	....	....	....	....	788	....	3,346	....	930	....	....	....	32,287
December	logs, M.B.M.	8,695	4,227	....	426		6,407	2,414	30,689	6,781	107,915	167,554	....	....	....
"	lineal ft., thds.	28	....	....	3	....	297	55	....	24	225	....	632	....	....
"	cords	3,971	....	....	....	....	1,130	371	15,000	....	21,860	....	....	42,332	....
"	ties	9,488	....	....	....	....	1,760	1,393	....	....	47,583	....	....	....	60,224
Total	logs, M.B.M.	120,722	13,283	699	22,164	312	43,871	38,675	241,674	71,721	850,603	1,403,724	....	....	....
"	lineal ft., thds.	511	....	64	123	9	2,490	336	294	595	1,667	....	6,089	....	....
"	cords	46,323	1,387	128	2,659	171	23,996	2,801	35,530	3,116	219,735	....	....	335,846	....
"	ties	299,878	22,959	....	61,612	46,190	54,872	7,284	3,346	77,157	872,564	....	....	....	1,445,862

Total, 1,647,275 M B.M.

TIMBER SCALED BY DISTRICTS



SPECIES CUT



NOTE. Figures for 1914 shew sawlogs only
Poles, Piles, Cordwood and Ties omitted

SPECIES CUT, 1917.

Forest District.	Douglas Fir.	Red Cedar.	Spruce.	Hemlock.	Balsam Fir.	Western Soft Pine.	White Pine.	Jack-pine.	Larch.	Cottonwood.	Yellow Cedar.	Birch.	Maple.	Total.
	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.	M.B.M.
Cranbrook	52,611	12,989	3,633	4	5,328	42,838	124	5,068	32,838	386	....	....	....	155,819
Fort George	1,719	186	11,255	5	460	....	....	714	....	354	....	2	....	14,695
Hazelton	....	615	367	101	....	....	....	....	....	....	....	....	....	1,083
Kamloops	13,835	7,163	2,006	85	96	1,893	901	50	....	....	....	....	....	26,029
Lillooet	414	....	....	....	....	14	....	1,452	....	....	....	5	....	1,885
Nelson	10,527	29,925	127	9,138	51	9,939	3,289	1	7,045	....	....	....	....	70,042
Vernon	7,609	404	218	....	....	33,531	132	....	22	60	....	....	....	41,976
Totals, Interior	86,715	51,282	17,606	9,333	5,935	88,215	4,446	7,285	39,905	800	....	7	....	311,529
Prince Rupert	3,395	15,261	38,811	11,075	8,626	....	....	1,475	....	....	12	....	....	78,655
Island	217,226	15,428	10,104	16,550	1,276	1	421	....	....	2	....	....	....	261,008
Vancouver	456,033	361,105	44,048	112,803	5,903	2,279	1,601	....	10,096	2,191	24	....	....	996,083
Total, Coast	676,654	391,794	92,963	140,428	15,805	2,280	2,022	1,475	10,096	2,193	36	....	....	1,335,746
Grand totals, 1917	763,369	443,076	110,569	149,761	21,740	90,495	6,468	8,760	50,001	2,993	36	7	....	1,647,275
Grand totals, 1916	564,691	385,096	85,329	101,315	21,406	71,783	6,816	3,088	38,706	1,944	75	11	3	1,280,263

TIMBER-SALES AWARDED BY DISTRICTS, 1917.

Forest District.	No. of Sales.	Acres in Area.	Estimated Quantity.					Estimated Revenue.
			Saw-timber (Ft. B.M.).	Poles and Piles. (Lineal Feet).	(Posts) (No.)	Shingle-bolts and Cordwood (Cords).	Railway-ties.	
Cranbrook	17	4,502	6,910,000	25,750	....	19,665	5,000	$ 23,765 42
Fort George	20	2,362	17,321,000	....	15,000	842	....	36,214 93
Island	4	225	1,103,000	4,000	....	167	....	2,206 12
Kamloops	22	7,956	17,083,000	596,000	25,000	150	142,800	43,317 41
Lillooet	3	142	175,000	....	....	125	....	352 50
Nelson	10	1,174	7,479,400	533,400	....	2,000	3,000	17,698 30
Prince Rupert	58	11,853	62,350,500	268,020	....	....	230,400	94,491 46
Vancouver	114	15,666	123,642,867	90,280	....	20,807	....	246,724 39
Vernon	7	1,034	4,242,290	....	....	....	....	8,510 97
Totals, 1917	255	44,914	240,307,057	1,517,450	40,000	43,756	381,200	$483,281 50
Totals, 1916	133	23,318	136,354,000	435,810	....	26,667	92,000	$259,765 12

AVERAGE SALE PRICE BY SPECIES, 1917.

Saw-timber.	Board-feet.	Price per M.
Douglas fir	43,139,000	$1 12
Cedar	72,822,000	1 24
Spruce	59,071,000	96
Tamarack	2,336,000	1 61
Hemlock	34,013,000	48
Balsam fir	21,790,000	54
White pine	1,203,000	1 24
Western soft pine	2,654,000	1 51
Other species	3,279,057	1 88
Totals	240,307,057	$0 99

TIMBER CUT FROM TIMBER-SALES DURING 1917.

Forest District.	Feet B.M.	Lineal Feet.	Cords.	Ties.
Cranbrook	2,503,517	60,525	4,018	....
Fort George	4,607,635	....	52	....
Island	....	4,000	....	....
Kamloops	2,896,332	39,965	.....	18,645
Lillooet	....	....	70	....
Nelson	1,177,645	230,385	402	4,092
Prince Rupert	10,380,849	150,305	....	12,200
Vancouver	75,205,642	41,365	10,320	....
Vernon	2,307,212	18,884	....	....
Totals, 1917	99,078,832	545,429	14,862	34,937
Totals, 1916	63,055,102	225,799	8,425	....

SAW AND SHINGLE MILLS OF THE PROVINCE, 1917.

Forest District.	SAWMILLS.		SHINGLE-MILLS.		SAWMILLS.		SHINGLE-MILLS.		SAWMILLS.		SHINGLE-MILLS.
	No.	Operating, with Estimated Daily Capacity.	No.	Operating, with Estimated Daily Capacity.	No.	Shut down, with Estimated Daily Capacity.	No.	Shut down, with Estimated Daily Capacity.	No.	Under Construction, with Estimated Daily Capacity.	Under Construction, with Estimated Daily Capacity.
Cranbrook	25	1,136,000	..	....	9	360,000	1	50,000	..	....	....
Fort George	15	315,000	1	50,000	3	20,000	..	....	5	145,000	....
Island	40	1,518,000	6	580,000	1	50,000	..	....	1	100,000	....
Kamloops	7	305,000	..	....	9	575,000	1	120,000	..	....	....
Lillooet	9	38,000	..	....	8	43,000	..	....	..	....	....
Nelson	13	396,000	9	755,000	16	448,000	..	....	..	....	....
Prince Rupert	19	445,000	2	208,000	9	155,000	..	....	1	125,000	....
Vancouver	71	3,728,000	52	8,662,000	15	755,000	13	650,000	..	....	....
Vernon	13	413,000	..	....	12	173,000	..	....	..	....	....
Totals	212	8,294,000	70	10,255,000	82	2,579,000	15	820,000	7	370,000	....

LOGGING INSPECTION.

Forest District.	Timber-sales.	Hand-loggers' Licences.	Leases, Licences, Crown Grants, and Pre-emptions.	Total Operations.	No. of Inspections.
Cranbrook	16	....	45	61	117
Fort George	18	....	8	26	24
Island	2	2	60	64	42
Kamloops and Lillooet	27	....	35	62	51
Nelson	14	....	126	140	194
Prince Rupert	30	92	25	147	240
Vancouver	110	47	265	422	891
Vernon	19	....	42	61	52
Totals	236	141	606	983	1,611

TRESPASS, 1917.

Forest District.	No. of Cases.	Area cut over (Acres).	Quantity Cut.				No. of Resulting Seizures.	Amount realized.
			Feet B.M.	Lineal Feet.	Cords.	Ties.		
Cranbrook	2	8	53,000	....	16	....	1	$ 122 00
Fort George	2	30	40,000	22,450	....	....	..	....
Island	4	100	356,518	4,438	....	....	..	393 56
Kamloops	..	....	....	....	...	....	..	....
Lillooet	..	....	....	....	...	....	..	....
Nelson	4	19.5	....	5,329	79	907	..	81 64
Prince Rupert	1	6	40,048	....	....	....	..	180 00
Vancouver	18	*	2,941,789	....	72	....	5	225 95
Vernon	5	185	1,091,733	4,460	50	....	..	1,251 28
Totals, 1917	36	348.5	4,523,088	36,677	217	907	6	$2,254 43
Totals, 1916	72	1,046	4,472,106	69,873	1,397	....	16	$3,821 32

*Not stated.

LAND CLASSIFICATION.

STATUS OF AREAS EXAMINED, 1917.

Forest District.	Lots.		Expired Timber Licences.		Pre-emption Records.		Application to Purchase.		Miscellaneous.	
	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.
Cranbrook	12	2,030	..	....	..	....	..	....	..	....
Fort George	361	141,611	..	....	20	3,342	..	....	27	22,783
Island	64	25,927	..	....	7	787	1	320	17	2,095
Kamloops	27	4,644	..	....	8	1,243	..	....	1	160
Lillooet	46	7,542	..	....	5	799	..	....	5	800
Nelson	13	1,706	..	....	3	400	2	240	1	160
Prince Rupert and Hazelton	167	55,431	..	....	14	1,845	8	2,317	9	2,808
Vancouver	67	16,618	3	1,623	20	1,849	2	480	2	200
Vernon	26	4,780	..	....	4	504	..	....	1	320
Totals	783	240,283	3	1,623	81	10,769	13	3,357	63	29,326

CLASSIFICATION OF AREAS EXAMINED, 1917.

Forest District.	Total Area.	Agricultural Land.	Area recommended for Reserve.	Estimate of Timber on Total Area.
				M.B.M.
Cranbrook	2,030	930	....	....
Fort George	167,736	118,133	5,120	292,750
Island	29,129	5,566	831	299,054
Kamloops	6,047	2,861	273	4,848
Lillooet	9,141	4,309	....	6,857
Nelson	2,506	726	313	5,141
Prince Rupert and Hazelton	62,401	37,341	1,208	137,160
Vancouver	20,770	4,292	9,804	154,954
Vernon	5,604	1,601	....	8,105
Totals	305,364	175,759	17,549	908,869

PRODUCTON OF PULP PAPER, 1917.

	1917. Tons.	1916. Tons.
Sulphite pulp	43,644	14,389
Sulphate pulp	2,863	...
Ground wood-pulp	65,620	...
Paper—		
Newsprint	75,833	65,229
Wrapper	3,170	

TIMBER EXPORTS.

EXPORT OF LOGS, 1917.

	Grade No. 1.	Grade No. 2.	Grade No. 3.	Ungraded.	Total.
Cedar	4,863,595	22,945,161	10,352,846	....	38,161,602
Fir	863,364	2,390,328	1,384,701	....	4,638,393
Spruce	250,875	977,409	264,678	....	1,492,962
Pine	....	....	645	24,695	25,340
(Larch) Balsam	....	....	....	1,117,245	1,117,245
Hemlock	....	....	....	5,729,499	5,729,499
Cypress	....	....	....	11,427	11,427
Totals, 1917	5,977,834	26,312,898	12,002,870	6,882,866	51,176,468
Totals, 1916	4,809,557	31,058,451	14,283,873	2,032,504	52,184,385

EXPORT OF POLES, PILES, PROPS, TIES, AND WOOD, 1917.

Forest District.	Quantity exported.	Approximate Value F.O.B.	WHERE MARKETED.	
			United States.	Canada.
Cranbrook—				
Posts	Cords, 20,731	103,655	....	20,731
Props	Cords, 17,932	107,592	....	17,932
Piling	Lin. ft., 342,915	24,004	....	342,915
Poles	Lin. ft., 149,886	9,173	10,700	139,186
Hewn ties	Pieces, 299,035	89,711	....	299,035
Mine-ties	Cords, 54	432	10	44
Wood	Cords, 4,438	22,190	....	4,438
Fort George—				
Fence-posts	Cords, 269	1,654	....	269
Excelsior bolts	Cords, 127	170	....	127
Island—				
Piling	Lin. ft., 154,830	13,712	154,830	....
Kamloops—				
Posts	Cords, 117	606	....	117
Poles	Lin. ft., 50,645	2,815	....	50,645
Nelson—				
Posts	Cords, 6,250	31,250	2,773	3,477
Piling	Lin. ft., 117,551	8,830	112,551	5,000
Poles	Lin. ft., 1,571,065	79,596	997,916	573,149
Wood	Cords, 20	100	20	...
Vancouver—				
Piling	Lin. ft., 641,735	48,027	641,735	....
Poles	Lin. ft., 569,585	39,841	569,585	....
Shingle-bolts	Cords, 321	3,210	321	....
Vernon—				
Hewn ties	Pieces, 4,481	1,616	4,481	....
Total	....	588,184	....	....

FOREST RECORDS.

FOREST REVENUE.

The total revenue from the forest collected in 1917 was $2,338,333.52, being an increase over 1916 of $332,398.76. The improvement in the prosperity of the lumber industry noted in the closing months of 1916 has continued throughout the past year. This is especially apparent in the amount received from logging operations (royalty and stumpage). Owing to the amelioration of conditions, the Department has been successful in reducing by 46 per cent. the arrears of royalty which were piled up during the depression which existed in 1914 and 1915. The following table gives the revenue in detail for the past five years:—

	12 Months to Dec., 1917.	12 Months to Dec., 1916.	12 Months to Dec., 1915.	12 Months to Dec., 1914.	12 Months to Dec., 1913.
Timber-licence rentals	$1,074,129 07	$1,138,879 22	$1,140,656 53	$1,555,980 28	$2,112,876 18
Royalty and tax	785,543 42	456,863 29	351,310 13	391,118 36	482,707 05
Trespass penalties	3,207 32	893 39	3,520 54	7,170 95	9,016 95
Lease rentals	76,426 74	77,040 59	120,132 35	88,792 08	119,291 44
Scaling fees	62,381 50	32,590 20	27,893 16	30,472 32	23,978 99
Scaling expenses	6,055 74	3,158 71	2,564 71	1,803 82	1,759 41
Seizure expenses	507 11	1,364 84	85 71	270 90	....
Licence penalties	11,928 01	28,524 00	16,692 69	25,335 00	24,291 00
Timber stumpage	113,498 13	68,779 87	67,250 42	36,545 33	18,719 92
Transfer fees	4,070 00	3,670 00	4,400 00	7,085 00	10,385 00
Hand-loggers' licence fees	9,700 00	7,100 00	5,550 00	5,200 00	5,025 00
Interest	68 04	100 09	1,117 81	115 13	17,208 84
Timber-mark fees	....	....	137 00	508 50	924 50
Timber-sales rentals	9,457 72	5,235 35	3,830 89	3,477 87	2,597 95
Timber-sales cruising	2,687 03	1,148 74	2,183 42	1,550 83	1,140 40
Timber-sales advertising	1,183 35	391 89	532 71	534 05	691 40
Scalers' examination fees	295 00	225 00	60 00	425 00	585 00
Copies of documents	561 53	401 80	128 00	569 57	....
Exchange	470 61	45 22	17 33	61 96	119 95
General miscellaneous	....	....	....	....	1,469 73
	$2,162,170 32	$1,826,412 20	$1,748,063 40	$2,157,018 95	$2,832,788 71
Taxation from Crown-grant timber lands	176,163 20	179,528 56	174,495 00	185,661 00	166,540 00
Total revenue from forest sources	$2,338,333 52	$2,005,940 76	$1,922,558 40	$2,342,679 95	$2,999,328 71

Revenue from Logging Operations, 1917.

Forest District.	Royalty and Tax.	Scaling Fees.	Trespass Penalties.	Seizure Expenses.	Scaling Expenses.	Stumpage.	Totals.
Vancouver	$374,094 87	$37,843 49	$ 542 81	$ 935 00	$4,405 65	$ 90,678 54	$508,500 36
Island	44,464 19	8,379 58	91 60	....	657 30	78 46	53,671 13
Cranbrook	80,885 69	71 44	102 00	....	....	6,879 43	87,938 56
Prince Rupert	42,052 44	3,544 95	135 00	....	....	9,882 79	55,615 18
Nelson	29,674 27	....	29 25	48 01	....	3,435 55	33,187 08
Vernon	18,833 60	....	873 30	193 75	32 00	4,118 37	24,051 02
Fort George	10,523 44	90	224 50	27 21	....	7,836 42	18,612 47
Hazelton	843 52	....	....	....	....	2 52	846 04
Lillooet	117 84	....	73 50	....	5 00	46 70	243 04
Kamloops	4,179 64	27 91	....	....	....	5,051 92	9,259 47
Totals	$605,669 50	$49,868 27	$2,071 96	$1,203 97	$5,099 95	$128,010 70	$791,924 35
Totals, 1916 operations	$500,574 76	$36,340 56	$1,713 85	$ 966 86	$3,422 24	$ 63,030 56	$606,048 83
Totals, 1915 operations	$401,383 84	$30,836 03	$2,313 15	$1,796 23	$3,210 62	$ 80,042 30	$519,582 17

FOREST EXPENDITURE.

The sums voted for forest-work for the fiscal year 1917-18 were as follows:—

Vote No. 12—	Salaries	$133,920
„ 294—	Trade Extension	10,000
„ 295—	Miscellaneous	85,000
Total		$228,920

In addition to this total, $140,000 was voted as the estimated amount of the Government's contribution to the Forest Protection Fund.

General Administrative Expenditure.

(For Nine Months, April to December 31st, inclusive.)

Forest District.	Vote No. 12: Salaries.	Vote No. 295: Miscellaneous.	Total.
Headquarters	$34,235 59	$7,703 19	$41,938 78
Cranbrook	4,343 25	2,830 03	7,173 28
Fort George	3,657 08	2,123 26	5,780 34
Island	4,549 55	2,178 60	6,728 15
Kamloops	3,210 25	2,925 69	6,135 94
Lillooet	975 00	543 78	1,518 78
Nelson	3,290 01	1,139 40	4,429 41
Prince Rupert	4,541 19	5,966 59	10,507 78
Vancouver	26,244 25	16,123 81	42,368 06
Vernon	2,806 59	1,312 83	4,119 42
Totals	$87,852 76	$42,847 18	$130,699 94

FOREST PROTECTION FUND.

The statement appended will show the standing as at December 31st, 1917, of the above funds. At the close of the fiscal year 1916-17, owing to the economies affected in the operation of the fund during that year and 1915-16, it was found possible to wipe off the $143,658.73 overcontributed in 1914 by the Government to cover the extremely bad fire season that year. There was a balance to the credit of the fund at April 1st, 1917, of $4,986.76, and on the nine months' working a deficit of $23,700.41 is shown. It must be recognized, however, that this deficit will be more than counterbalanced by the amounts collected from timber-owners during January, February, and March, 1918 (to which the Government will add a like sum), so that the fund will be in credit at the close of the year's working.

Forest Protection Fund Statement.

Fiscal year 1912-13—			
Collections	$105,259 42		
Government's contribution	105,259 42	$210,518 84	
Expenditure	$207,624 99		
Less refunds	3,454 93	204,170 06	
Balance to credit of fund			$ 6,348 78
Fiscal year 1913-14—			
Brought forward from 1912-13	$ 6,348 78		
Collections	165,018 33		
Government's contribution	165,018 33	$336,385 44	
Expenditure	$342,361 64		
Less refunds	21,549 31	320,812 33	
Balance to credit of fund			15,573 11
Fiscal year 1914-15—			
Brought forward from 1913-14	$ 15,573 11		
Collections	122,341 27		
Government's contribution	$122,341 27		
Loan by Government, $100,000; overcontributed on estimates, $43,658.73	143,658 73	266,000 00	$403,914 38
Expenditure	$403,140 93		
Less refunds	16,785 89	386,355 04	
Balance to credit of fund			17,559 34

Fiscal year 1915-16—			
Brought forward from 1914-15	$ 17,559 34		
Collections	114,784 55		
Government's contribution	114,784 55	$247,128 44	
Expenditure	$185,538 46		
Less refunds	1,394 30	184,144 16	
Balance to credit of fund			$62,984 28
Fiscal year 1916-17—			
Brought forward from 1915-16	$ 62,984 28		
Collections, fiscal year 1916-17	120,392 40		
Government's contribution	120,392 40	303,769 08	
Expenditure, fiscal year 1916-17	$156,570 93		
Less refunds	1,447 34		
	$155,123 59		
Amount overcontributed by Government, 1914-15	143,658 73	298,782 32	
Balance to credit of fund			4,986 76
Balance to credit of fund at April 1st, 1917	$ 4,986 76		
Collections, April to December, 1917 (nine months)	83,712 75		
Government's contribution, April to December, 1917 (nine months)	83,712 75	172,412 26	
Expenditure (nine months)	$205,151 40		
Less refunds (nine months)	9,038 73	196,112 67	
Deficit in nine months' working			23,700 41

Forest Protection Expenditure.

	Fiscal Years.				
	1913-14.	1914-15.	1915-16.	1916-17.	1917-18 (9 mos., April 1st to Dec. 31st, 1917).
Patrol	$217,093	$228,352	$157,432	$144,251 28	$110,465 01
Improvements	104,000	31,385	5,151	3,747 86	5,097 85
Fires	9,600	143,461	19,449	7,124 45	89,588 54
Totals	$330,693	$403,198	$182,032	$155,123 59	$205,151 40

Expenditure by Districts for Nine Months ending December 31st, 1917.

Forest District.	Patrol.	Improvements.	Fires.	Total.
Headquarters	$ 8,792 92	....	....	$ 8,792 92
Cranbrook	12,612 48	$1,560 93	$16,014 41	30,187 82
Fort George	14,441 25	....	364 06	14,805 31
Island	9,555 70	....	6,808 52	16,364 22
Kamloops	8,906 05	457 25	847 56	10,210 86
Lillooet	3,834 92	1 75	194 85	4,031 52
Nelson	12,631 93	899 31	54,014 08	67,545 32
Prince Rupert	11,289 97	....	206 75	11,496 72
Vancouver	20,652 75	1,098 58	3,644 55	25,395 88
Vernon	7,747 04	1,080 03	7,493 76	16,320 83
Total	$110,465 01	$5,097 85	$89,588 54	$205,151 40

Monthly Patrol Expenses, 1917.

District.	April.	May.	June.	July.	August.	September.	Oct.-Dec.
Headquarters*	$8,254 61	$ 301 29	$ 46 09	$ 104 66	$ 20 23	$ 45 15	$ 20 89
Cranbrook	38 00	1,215 26	1,611 61	2,692 21	3,768 04	2,283 16	1,004 20
Fort George	561 23	1,857 58	2,718 47	2,633 77	3,297 43	2,687 00	685 77
Island	58 75	934 05	1,448 06	2,062 45	3,129 07	1,382 35	540 97
Kamloops	6 75	1,348 76	1,510 42	1,840 85	2,294 24	1,544 98	360 05
Lillooet	100 70	359 40	713 34	665 20	852 34	853 52	290 42
Nelson	8 25	1,116 23	1,810 90	3,382 11	4,373 18	1,533 28	362 98
Prince Rupert	120 75	2,152 53	2,141 76	2,673 00	2,721 07	980 87	499 99
Vancouver	22 88	3,287 43	3,217 66	4,806 09	6,028 82	2,273 27	1,006 60
Vernon	....	792 07	1,064 45	1,848 74	2,626 19	1,284 47	131 12
Totals	$9,171 92	$13,409 60	$16,282 76	$22,709 08	$29,110 61	$14,868 05	$4,902 99

* Out of this amount, the sum of $7,325 was paid for thirteen Ford runabouts with boxes attached, distributed as follows: Island District, 3 cars; Vancouver District, 1 car; Kamloops District, 1 car; Vernon District, 2 cars; Nelson District, 1 car; Cranbrook District, 3 cars; Fort George District, 1 car; Lillooet District, 1 car.

CO-OPERATION WITH BRITISH WAR OFFICE.

The Department during the past year has continued to act as fiscal agents for the British War Office for their lumber purchases in this Province. The following table shows the number and value of ammunition-boxes shipped:—

Order No.	No. of Cars shipped.	No. of Boxes shipped.	No. in Storage.	Value.
25	118	500,000	....	$182,500
27-29	48	231,150	354,900	246,347
Totals	166	731,150	354,900	$428,847

In addition to the ammunition-boxes, 1,530,098 feet B.M. of lumber has been shipped, the value of these shipments being $66,716.87.

TIMBER LICENCES.

The total number of timber licences on the books at December 31st, 1917, was 13,963. Below is a statement showing the number of paid and unpaid licences, and their distribution, as between Coast and Interior:—

	Coast.	Interior.	Total.
Number of licences at December 31st, 1917	8,218	5,745	13,963
Number fully paid	4,700	2,651	7,351
Number paid under section 4 of the 1917 "Relief Act" (July to December)	138	102	240
Number in arrears (reinstatable)	3,380	2,992	6,372
	(41%)	(52%)	(46%)

The revenue collected through the operation of section 4 of the 1917 "Relief Act" amounted to $28,520 for the six months July to December. The section named provided that all annual renewal fees falling due after July 1st, 1917, must be paid within one year of the annual renewal dates, in order to prevent absolute expiry of the licences. It is expected that as the year of grace draws to its close payments under this section will increase. An incidental effect of the section will be to disclose the number of dead licences which hitherto, owing to the operation of the "Relief Act," have had to be considered as reinstatable.

CROWN-GRANT TIMBER LANDS.

	Area of Private Timber Lands.	Average Value per Acre.
1911	824,814	$8 72
1912	874,715	8 60
1913	922,948	9 02
1914	960,464	9 66
1915	913,245	9 55
1916	922,206	9 73
1917	916,726	9 61

The extent and value of timber land in the various assessment districts are shown by the following table:—

Forest District.	Acreage, 1917.	Increase or Decrease in Acreage over 1916.	Average Value per Acre.	Change in Value per Acre since 1916.
Victoria	14,637	−2,305	$13 51	+0.21
Cowichan	87,079	+ 2	14 87	−0.01
Alberni	44,368	No change	18 31	No change
Nanaimo	78,244	No change	12 83	No change
Comox	216,630	−1,265	13 64	−0.35
Rossland	24,478	No change	3 73	−0.30
Kettle River	5,094	No change	3 00	No change
Slocan	44,423	No change	5 29	No change
Vancouver	6,660	− 768	14 66	−1.07
Nelson	176,294	− 802	3 77	−0.08
Vernon	6,422	No change	4 99	No change
Golden	77,786	− 124	3 86	−0.01
Revelstoke	48,599	+ 160	11 52	−0.03
Fort Steele	86,282	− 378	6 39	−0.02
Totals	916,726	−5,480	$9 61	+0.12

TIMBER-MARKS.

During the past year a total of 639 new marks were issued and 298 transfers, extensions, and changes in old marks were made, which indicates a very general increase of operations, particularly with regard to hand-logging, 365 hand-logging licences being issued for 1917, as against 290 issued for 1916.

These new marks, transfers, etc., have been included in the timber-mark list, a book mentioned in the last annual report as being issued monthly, giving a full classified list of all marks authorized for use in logging operations within the Province where logs are floated.

Owing to the rapid increase of marks, the time and detail required to revise this list, it is now issued quarterly, and interim monthly returns of marks issued are furnished to the forest officials and mill operators, etc., who subscribe for this reference list.

The following table gives the marks issued, classified by the status of land covered:—

	1916.	1917.
On old Crown grants	45	56
On Crown grants, 1887-1906	47	41
On Crown grants, 1906-1914	29	35
On timber under the "Royalty Act, 1914"	115	133
On timber leases	69	15
On sixteen-year timber licences	1	2
On timber-sales	100	176
On Dominion lands	51	22
On hand-loggers' licences	106	159
Totals	563	639

CORRESPONDENCE.

	1917.	Daily Average.	
Incoming mail	28,300	92	Decrease over 1916, 17 per cent.
Outgoing mail	42,500	138	Decrease over 1916, 33 per cent.

FOREST BRANCH ORGANIZATION.

DISTRIBUTION OF TOTAL FORCE, BRITISH COLUMBIA FOREST BRANCH, 1917.

Forest District.	PERMANENT.										TEMPORARY.							
	Chief Forester and Foresters.	Assistant Foresters.	District Foresters.	Accountants and Inspectors.	Office Clerks and Draughtsmen.	Forest Assistants.	Scalers.	Cruisers and Compass-men.	Rangers.	Launch Crews.	Assistant Rangers.	Patrolmen.	Packers and Canoe-men.	Lookout-men.	Railway Patrolmen.	Rangers' Assistants, Compass-men, etc.	Others.	Grand Total.
Cranbrook	....	....	1	....	1	....	1	....	3	....	5	13	....	2	....	....	....	....
Fort George	....	....	1	....	1	....	....	....	4	....	13	7	....	....	....	....	....	....
Island	....	....	1	....	1	....	2	....	3	....	6	12	....	....	....	1	1	....
Kamloops	....	....	1	....	1	....	1	....	2	....	6	10	....	....	....	....	....	....
Lillooet	....	....	1	....	....	....	....	....	....	....	4	2	....	....	....	....	....	....
Nelson	....	....	1	....	1	....	....	....	3	....	7	19	....	....	....	....	....	....
Prince Rupert	....	....	1	....	1	....	2	....	4	5	8	1	....	....	....	....	....	....
Vancouver	....	....	1	....	10	....	17	....	8	7	9	17	....	....	....	....	2	....
Vernon	....	....	1	....	1	....	....	....	2	....	4	11	....	....	....	....	....	....
Victoria Headquarters	1	3	....	2	31	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	1	3	9	2	48	....	23	....	29	12	62	92	....	2	....	1	3	287
Totals, 1916	3	3	9	....	50	1	21	2	31	16	163	23	1	5	2	2	4	336
Totals, 1915	4	3	11	....	50	12	17	10	36	17	177	25	7	1	2	1	5	378

AREA OF ADMINISTRATIVE AND PROTECTIVE UNITS, 1917.

Forest District.	Total Land Area.	No. of Ranger Districts.	Average Area, Ranger Districts.	No. of Assistant Ranger Districts.	Average Area, Assistant Ranger Districts.	Maximum No. Assistant Rangers and Patrolmen during Season.	Average Minimum Area, Assistant Rangers and Patrolmen Districts.
	Acres.		Acres.		Acres.		Acres.
Cranbrook	7,560,000	3	2,520,000	5	1,512,000	18	420,000
Fort George	39,375,000	4	9,843,750	13	3,028,846	20	1,968,750
Island	6,390,000	3	2,130,000	6	1,065,000	18	355,000
Kamloops	9,470,000	2	4,735,000	6	1,578,333	16	591,875
Lillooet	12,670,000	..	....	4	3,167,500	6	2,111,666
Nelson	7,950,000	3	2,650,000	7	1,135,714	26	305,769
Hazelton and Prince Rupert	44,980,000	4	11,245,000	8	5,622,500	9	4,997,777
Vancouver	15,770,000	8	1,971,250	9	1,752,222	26	606,538
Vernon	5,835,000	2	2,967,500	4	1,458,750	15	389,000
Totals	150,000,000	29	4,390,689*	62	2,419,354	154	974,026
Totals, 1916	150,000,000	31	4,838,700	163	920,245	186	806,450
Totals, 1915	150,000,000	36	4,166,600	177	847,450	202	742,550

*Lillooet land area is not included in this, as the District Forester undertook the Ranger's work.

FOREST PROTECTION.

CO-OPERATION, 1917.

Forest District.	Name of Firm.	No. of Patrolmen.	Region patrolled.
Cranbrook	Canadian Pacific Railway Co.	2	Yahk Tie Reserve.
"	" "	1	Yahk to Moyie.
"	" "	1	Kimberley.
"	" "	2	Bull River Tie Reserve.
"	Hale & Hall	1	Canal Flats.
"	East Kootenay Lumber Co.	1	Logging Railway.
"	Ross-Saskatoon Lumber Co.	1	"
"	Crow's Nest Pass Lumber Co.	1	"
"	Staples Lumber Co.	1	"
Island	City of Victoria	5	Sooke pipe-line.
"	Cowichan Lake Lumber Co.	3	Cowichan Lake-Duncan.
"	V. H. May	1	Campbell Lake.
"	British American Timber Co.	2	Campbell Lake and River.
Kamloops	E. V. Dunlevie	1	Blue River to Thompson Crossing.
Nelson	Benton Pole & Lumber Co.	1	Benton Siding.
"	A. B. Buckworth	2	Erie.
"	Trader's National Bank	1	"
"	Kootenay Cedar Co.	1	Lardeau.
"	J. A. Nowell	1	Cutler's Creek.
"	Royal Lumber Co.	1	Duncan River.
"	Arrow Lakes Lumber Co.	1	Arrowhead.
"	Forest Mills	1	Nelson.
"	Island Mill Lumber Co.	1	Arrow Park.
"	Mankin Lumber & Pole Co.	1	Hall.
"	Trail Lumber Co.	1	Paulson.
Vancouver	Merrill & Ring	1	Powell Lake and Theodosia River.
"	North Pacific Lumber Co.	1	Campbell Lake.
Vernon	Central Okanagan Lands, Ltd.	1	Rutland.
"	South Kelowna Land Co.	1	Hydraulic Creek.
"	White Valley Irrigation Co.	1	Aberdeen Lake.
"	Belgo-Canadian Fruitlands Co.	1	Eight-mile Creek.
"	Municipality of Penticton.	1	Penticton Creek.
"	Kelowna Land & Orchard Co., Ltd.	1	Mission Creek.
"	Canyon Creek Irrigation Co., Ltd.	1	Canyon Creek.
"	Kelowna Irrigation Co.	1	Mission Creek.
"	Black Mountain Water Co., Ltd.	2	Eight-mile Creek and Mission.

Damage caused by Forest Fires, 1917.

Table A.—Area burned over and Damage to Forests.

Forest District.	Merchantable Timber destroyed or damaged.				Valuable Second Growth.		Cut-over Land, Unmerchantable Timber, Old Burn, not restocking.			Grazing Range.		Grand Totals.					
	Area.	Quantity Total Loss.	Quantity salvable.	Damage.	Area.	Estimated Damage.	Area.	Quantity killed.	Damage to Standing Timber.	Area.	Damage.	Area.		Quantity.		Damage.	
	Acres.	M. Ft. B.M.	M. Ft. B.M.		Acres.		Acres.	M. Ft. B.M.		Acres.		Acres.	Per Cent.	M. Ft. B.M.	Per Cent.		Per Cent.
Cranbrook	17,536.00	166,460	15,000	$79,842 50	6,650.00	$10,540 00	53,256.60	60.0	$ 95 00	1,937.00	$ 800 00	79,379.60	33.47	181,520	67.95	$91,277 50	70.70
Fort George	64.00	287	..	342 75	0.50	....	1,723.10	..	....	117.40	....	1,905.00	0.80	287	0.11	342 75	0.26
Prince Rupert and Hazelton	106.75	710	100	360 40	457.50	187 00	2,267.00	110.0	25 00	148.75	30 00	2,980.00	1.26	920	0.34	602 40	0.47
Island	415.00	2,700	1,208	2,454 50	166.50	76 00	10,206.50	..	....	825.00	....	11,613.00	4.85	3,908	1.46	2,530 50	1.96
Kamloops	602.50	1,985	50	1,685 00	1,651.50	....	6,694.50	..	....	4,330.00	....	13,288.50	5 60	2,035	0.76	1,685 00	1.30
Lillooet	1,387.50	1,936	..	1,098 20	2,206.60	606 25	3,132.60	10.0	....	2,638.00	248 95	9,364.70	3.95	1,946	0.73	1,953 40	1.51
Nelson	4,592.20	40,026	29,255	14,618 60	3,138.00	2,964 50	48,896.85	0.5	100 00	6,748.15	2,522 25	63,375.20	26.72	69,281.5	25.93	20,205 35	15.65
Vancouver	1,056.25	2,540	1,270	1,800 00	969.00	3,310 00	5,428.50	..	....	12.00	255 00	7,465.75	3.15	3,810	1.42	5,365 00	4.15
Vernon	2,265.50	2,229	1,250	1,017 00	986.00	59 10	27,784.50	..	....	16,881.25	4,086 85	47,917.25	20.20	3,479	1.30	5,162 95	4.00
Totals	28,025.70	218,873	48,133	$103,218 95	16,225.60	$17,742 85	159,390.15	180.5	$220 00	33,647.55	$7,943 05	237,289.00	100.00	267,186.5	100.00	$129,124 85	100.00
Per cent. of grand totals	11.80	81.92	18.02	79.95	6.80	13.74	67.20	0.06	0.16	14.20	6.15	100.00	..	100.00	..	100.00	..
Totals, 1916	15,304.00	47,653	2,757	$47,333 00	11,277.74	$219 00	111,045.36	0.5	Not	23,661.37	$1,361 00	161,288.47	..	50,415	..	$48,913 00	..
Per cent.	9.0	94.5	5.5	96.7	7.0	0.5	69.0	..	given.	15.0	2.8	100.0	..	100.0	..	100.0	..
Totals, 1915	30,310.00	144,220	43,030	$88,043 00	13,317.00	$20,504 00	148,246.00	659.0	Not	52,316.00	$326 00	244,189.00	..	187,909	..	$108,873 00	..
Per cent.	12.4	76.7	22.9	80.9	5.5	18.8	60.7	0.4	given.	21.4	0.3	100.0	..	100.0	..	100.0	..

Table B.—Damage to Property other than Forests.

Forest District.	Forest Products in Process of Manufacture.	Buildings.	Railway and Logging Equipment.	Miscellaneuos.	Totals.	Per Cent.
Cranbrook	$28,250 00	$2,100 00	....	$240 00	$30,590 00	18.84
Fort George	....	25 00	....	....	25 00	0.01
Hazelton and Prince Rupert	105 00	115 00	....	50 00	270 00	0.17
Island	30,541 00	700 00	$10,000 00	240 00	41,481 00	25.56
Kamloops	3,516 00	600 00	2,360 00	....	6,476 00	3.99
Lillooet	25 00	....	....	18 75	43 75	0.02
Nelson	8,375 75	25,103 00	2,350 00	7,810 00	43,638 75	26.88
Vancouver	7,909 00	29,920 00	....	.. .	37,829 00	23.31
Vernon	440 00	1,500 00	....	40 00	1,980 00	1.22
Totals	$79,161 75	60,063 00	$14,710 00	$8,398 75	$162,333 50	100.00
Per cent	48.77	37.00	9.06	5.17	100.0	
Totals, 1916	$2,980 00	$18,396 00	$3,808 00	$1,778 00	$26,962 00	....
Per cent	11.00	68.2	14.2	6.6	100.00	....
Totals, 1915	$10,546 00	$29,740 00	$12,825 00	$4,663 00	$57,774 00	....
Per cent	18.2	51.5	22.2	8.1	100.0	....

Table C.—A Comparison of the Damage caused by Forest Fires in Last Seven Years.

	1917.	1916.	1915.	1914.	1913.	1912.	1911.
Total number of fires	986	864	1,031	1,832	578	347	331
Area burned over (acres)	237,289	161,288	244,189	355,124	10,270	160,000	Not given.
Standing timber destroyed or damaged (M.B.M.)	267,186	50,415	187,250	102,804	3,845	200,000	3,570
Amount salvable (M.B.M.)	48,133	2,757	43,030	Not given.	Not given.	Not given.	Not given.
Damage to forests	$129,124	$48,913	$108,873	$72,057	$ 4,387	$200,000	Not given.
Damage to other forms of property	162,333	26,962	57,774	364,475	13,967	113,273	47,000
Total damage	291,457	75,875	166,647	436,532	18,354	313,273	....

Cost of Fire-fighting.

Fires, 1917, classified by Place of Origin and Cost of Fire-fighting.

Forest District.	Total Fires.	Originated on Vacant Crown Lands and Lands paying Tax (F.P.)	Originated on Alienated Land not paying Tax (F.P.)	Extinguished without Cost.			Cost Money to extinguish.			Total Cost of Fire-fighting.		Average Cost per Fire.
	No.	No.	No.	No.	Per Cent. of Total Fires in District.	Per Cent. of Total Fires in Province.	No.	Per Cent. of Total Fires in District.	Per Cent. of Total Fires in Province.	Dollars.	Per Cent. of Total spent fighting Fires in Province.	Dollars.
Cranbrook	319	31	288	251	79	25	68	21	7	15,785	17	232
Fort George	45	27	18	27	60	3	18	40	2	166	.....	9
Hazelton and Prince Rupert	45	2	43	39	62	4	6	16	1	304	1	50
Island	83	27	56	45	54	4	38	46	4	7,282	8	191
Kamloops	41	18	23	11	27	1	30	73	3	801	2	26
Lillooet	39	25	14	28	72	3	11	28	1	208	1	19
Nelson	189	35	154	101	53	10	88	47	9	52,906	59	601
Vancouver	117	58	59	57	69	6	60	51	6	2,330	3	47
Vernon	108	34	74	66	61	7	42	39	4	7,961	9	189
Totals	986	257	729	625	.....	63	361	.....	37	88,243	100	244
Per cent.	100.0	26.1	73.9	63.4	.....	.....	36.6	.....	.....	.....	.....	.....
Totals, 1916	864	209	655	693	.....	80	171	.....	20	.....	.....	.....
Per cent	100.0	24.2	75.8	80.2	.....	.....	19.8	.....	.....	5,585	100	32
Totals, 1915	1,031	341	690	714	.....	69.3	317	.....	30.7	.....	.....	.....
Per cent	100.0	33.1	66.9	69.3	.....	.....	30.7	.....	.....	19,449	100	61

Fires, 1917, classified by Size and Damage.

Forest District.	Total Fires.		Under ¼ Acre.			¼ Acre to 10 Acres.			Over 10 Acres in Extent.			Damage.		
	No.	Per Cent.	No.	Per Cent. of Total Fires in District.	Per Cent. of Total Fires in this Class.	No.	Per Cent. of Total Fires in District.	Per Cent. of Total Fires in this Class.	No.	Per Cent. of Total Fires in District.	Per Cent. of Total Fires in this Class.	Under $100.	Between $100 and $1,000.	Over $1,000.
Cranbrook	319	32.3	173	54.2	65.0	77	24.2	19.5	69	21.6	21.2	10	10	13
Fort George	45	4.6	7	15.5	2.6	30	66.7	7.6	8	17.8	2.5	4	2	.....
Hazelton and Prince Rupert	45	4.6	.....	.....	.....	28	62.2	7.1	17	37.8	5.2	5	1	.....
Island	83	8.4	17	20.5	6.4	27	32.5	6.9	39	47.0	12.0	9	13	2
Kamloops	41	4.2	1	2.4	0.4	20	48.8	5.1	20	48.8	6.1	.....	.....	1
Lillooet	39	3.9	7	17.9	2.6	11	28.2	2.8	21	53.9	6.5	20	4	.....
Nelson	189	19.2	42	22.2	15.8	88	46.6	22.3	59	31.2	18.2	45	18	12
Vancouver	117	11.9	14	12.0	5.3	69	59.0	17.4	34	29.0	10.5	13	6	9
Vernon	108	10.9	5	4.6	1.9	45	41.7	11.3	58	53.7	17.8	41	13	2
Totals	986	100.0	266	.....	100.0	395	.....	100.0	325	.....	100.0	147	67	39
Per cent.	.....	.....	27.0	.....	.....	40.1	.....	.....	32.9	.....	.....	.....	.....	.....
Totals, 1916	864	.....	230	.....	.....	336	.....	.....	298	.....	.....	127	50	15
Per cent.	.....	.....	26.6	.....	.....	38.9	.....	.....	34.5	.....	.....	.....	.....	.....
Totals, 1915	1,031	.....	231	.....	.....	371	.....	.....	429	.....	.....	288	117	24
Per cent.	.....	.....	22.4	.....	.....	36.0	.....	.....	41.6	.....	.....	.....	.....	.....

CAUSES OF FOREST FIRES, 1917.

Table A.—Number and Causes of Fires, 1917.

Forest District.	(1.) Campers and Travellers.	(2.) Unknown Causes.	(3.) Operation of Railways.	(4.) Lightning.	(5.) Brush-burning.	(6.) Railway-construction.	(7.) Miscellaneous (known).	(8.) Industrial Operation.	(9.) Incendiary.	(10.) Public Road-construction.	Totals. No.	Totals. Per Cent.
Cranbrook	23	35	215	13	2	....	29	....	2	....	319	32.3
Fort George	16	13	2	2	2	....	2	....	5	3	45	4.6
Hazelton and Prince Rupert	28	10	3	....	2	....	....	....	....	2	45	4.6
Island	35	17	6	....	3	....	2	19	1	....	83	8.4
Kamloops	1	12	16	4	7	....	....	....	1	....	41	4.2
Lillooet	18	12	1	....	2	....	5	....	1	....	39	4.0
Nelson	10	56	73	21	15	....	9	4	1	....	189	19.2
Vancouver	32	31	5	2	5	....	6	36	....	....	117	11.8
Vernon	46	28	14	6	10	....	2	....	2	....	108	10.9
Totals	209	214	335	48	48	....	55	59	13	5	986	100.0
Per cent.	21.2	21.8	33.9	4.9	4.9	....	5.6	5.9	1.3	0.5	100.0	....

Table B.—Number and Causes of Forest Fires for Last Seven Years.

Causes.	1917.	1916.	1915.	1914.	1913.	1912.	1911.
Campers and travellers	209	268	305	487	195	51	126
Unknown	214	148	160	367	104	149	126
Operation of railways (common carriers only)	335	121	82	361	110	34	31
Lightning	48	67	100	169	34	23	1
Brush-burning (to clear farm land, etc.)	48	148	267	164	26	47	14
Railway-construction	....	....	17	98	62	11	8
Miscellaneous	55	19	24	83	7	6	3
Industrial operations (logging, etc.)	59	59	28	50	24	17	14
Incendiary	13	22	28	42	7	....	....
Public road-construction	5	12	20	11	9	9	8
Totals	986	864	1,031	1,832	578	347	331

BURNING PERMITS, 1917.

Forest District.	Clearing Agricultural Land.				Clearing Logging-slash.				Clearing Railway Right-of-way.				Clearing Public Roads.				Grand Totals.			
	Permits issued.	Area burned over.	Fires escaped Control.	Fires set without Permits.	Permits issued.	Area burned over.	Fires escaped Control.	Fires set without Permits.	Permits issued.	Area burned over.	Fires escaped Control.	Fires set without Permits.	Permits issued.	Area burned over.	Fires escaped Control.	Fires set without Permits.	Permits issued.	Area burned over.	Fires escaped Control.	Fires set without Permits.
	No.	Acres.	No.	No.	No.	Acres.	No.	No.	No.	Acres.	No.	No.	No.	Acres.	No.	No.	No.	Acres.	No.	No.
Cranbrook	340	1,807	1	2	2	100	..	..	2	50	..	..	..	..	..	..	344	1,957	1	2
Fort George	921	4,205	1	42	37	203	..	..	1	2	..	..	1	35	..	..	960	4,445	1	42
Hazelton and Prince Rupert	382	3,572	2	..	2	28	1	1	..	..	..	..	5	43	1	..	389	3,643	4	1
Island	376	3,487	..	3	10	543	..	..	3	25	..	..	5	21	..	..	394	4,076	..	3
Kamloops	284	1,128	4	2	5	15	..	1	7	10	..	..	..	..	..	..	296	1,153	4	3
Lillooet	125	1,103	..	2	..	..	..	..	..	..	..	..	4	23	..	..	129	1,126	..	2
Nelson	1,065	638	3	10	6	102	..	..	8	..	..	..	2	96	..	..	1,081	836	3	10
Vancouver	264	471	..	1	14	1,052	1	2	1	1	..	..	6	9	..	..	285	1,533	1	3
Vernon	202	2,600	1	9	34	325	..	..	1	10	..	..	..	..	..	..	237	2,935	1	9
Totals	3,959	19,011	12	71	110	2,368	2	4	23	98	..	..	23	227	1	..	4,115	21,704	15	75
Per cent	96.2	87.6	80.0	94.7	2.7	10.9	13.3	5.3	0.55	0.5	..	..	0.55	1.0	6.7	.	100.0	100.0	100.0	100.0
Totals, 1916.	6,901	20,344	51	61	150	2,332	..	1	93	2,157	..	1	112	161*	..	2	7,256	24,833	51	65
Per cent	95.1	81.9	100.0	94.0	2.1	9.4	..	1.5	1.3	8.7	..	1.5	1.5	..	..	30	100.0	100.0	100.0	100.0

* Miles.

Prosecution for Fire Trespass, 1917.

Forest District.	Information laid.	Character of Offences.				Result of Cases.				
		Burning without Permit.	Incendiary.	Leaving Camp-fires burning.	Refusing to fight Fire.	Served Sentence in Gaol.	Fines.		Suspended Sentence.	Cases dismissed.
							No.	Amount.		
Cranbrook	3	2	....	....	1	....	2	$ 35 00	....	1
Fort George	1	1	....	....	....	....	1	25 00	....	....
Hazelton and Prince Rupert	....	....	....	....	....	....	....	....	....	....
Island	....	....	....	....	....	....	....	....	....	....
Kamloops	....	....	....	....	....	....	....	....	....	....
Lillooet	....	....	....	....	....	....	....	....	....	....
Nelson	2	....	2	....	....	....	2	107 65	....	....
Vancouver	1	1	....	....	....	....	1	150 00	....	....
Vernon	5	3	2	....	....	....	3	150 00	....	2
Totals	12	7	4	....	1	....	9	$477 65	....	3
Totals, 1916	4	4	....	....	....	1	....	....	3	....

PERMANENT IMPROVEMENTS.

Summary of New Improvements, 1917.

Kind of Work.	No.	Miles.	Cost.	Cost per Mile or Unit.
Wagon-road	1	1	$ 131 13	$131 13
Horse-trails	13	113½	2,273 26	20 12
Bridges	1	30 feet	15 00	15 00
Launch and boats	2	....	260 00	130 00
Shelters for motor-car	1	....	43 80	43 80
Total	....	....	$2,723 19	....

Maintenance-work done on Permanent Improvements, 1917.

Kind of Work.	No.	Miles.	Cost.	Cost per Mile.
Horse-trails	44	496	$1,051 55	$ 2 12
Telephone-lines	4	132	2,529 44	19 16
Total	....	....	$3,580 99	....

List of Improvements in each District.

Kamloops Forest District.

New work—

	Miles.
Tete Jaune Cache Wagon-road	1
Kiwa Creek Trail	4
Seymour-Humanilt Trail	8
Depot Camp-Momick Trail	8
Little Clearwater Bridge, 30 feet.	
Clearwater Lake Trail	2½

Lillooet Forest District.

New work—

New boat, 16 feet by 4 feet 6 inches.

Vernon Forest District.

New work—	Miles.
Park Mountain Trail	18
Canyon Creek-Sawmill Creek Trail	7
Voigt Valley-Brookmere Trail	6
Three Brothers-Cambie River Trail	23
Granite-Nine-mile Trail	11
Migessula-Siwash Creek Trail	6
Sugar Lake Trail	6
Squaw Valley-Moore Lake Trail	6

Mabel Lake Launch, 22 feet.
Shelter for Car, 12' x 16 feet.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

WATER RIGHTS BRANCH

OF THE

DEPARTMENT OF LANDS

HON. T. D. PATTULLO, Minister

WILLIAM YOUNG, Comptroller

FOR THE YEAR ENDING DECEMBER 31ST

1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

WATER RIGHTS BRANCH.

DEPARTMENT OF LANDS, VICTORIA, B.C.

Roll of Honour

Lieut. T. H. Bewlay, Assistant Engineer, Royal Garrison Artillery.
Lieut. J. M. Case, Assistant Engineer, Canadian Engineers, C.E.F.
Sergeant-Major W. T. Taylor, Draughtsman, 47th Battalion, C.E.F.

Major C. C. Allen, Assistant Engineer	172nd Battalion, C.E.F.
Lieut. A. P. Augustine, Assistant Engineer	Canadian Engineers, C.E.F.
Lieut. R. H. Columbine, Clerk	Bedfordshire Regiment.
Sergeant A. O. G. Crawford, Clerk	C.A.S.C., C.E.F.
Lieut. K. R. F. Denniston, Clerk	Royal Field Artillery.
Sub-Lieut. W. B. Evans, Draughtsman	Royal Naval Air Service.
Private G. R. Ford, Draughtsman	103rd Battalion, C.E.F.
Corporal W. P. Hall, Clerk	Infantry, C.E.F.
*Private A. G. Hatton, Draughtsman	5th Battalion, C.E.F.
Private S. C. Hawkins, Clerk	88th Regt. Overseas Co.
Major H. B. Hicks, District Engineer	54th Battalion, C.E.F.
*Lieut. A. J. Hudson, Clerk	48th Battalion, C.E.F.
Lieut. E. A. Jamieson, District Engineer	Canadian Army Ordnance.
Lieut. H. A. T. Jones, Clerk	Durham Light Infantry.
*Gunner F. W. Knewstubb, Divisional Engineer	Can. Field Artillery, C.E.F.
Capt. J. R. Lewin, Clerk	C.A.M.C., C.E.F.
Private A. Long, Draughtsman	C.A.M.C., C.E.F.
Sapper R. H. Lowry, Draughtsman	Canadian Engineers, C.E.F.
Bombardier A. D. Marshall, Draughtsman	Can. Field Artillery, C.E.F.
Sergeant J. R. Mountain, Clerk	88th Regt. Overseas Co.
Lieut. O. F. D. Norrington, District Engineer	143rd Battalion, C.E.F.
Gunner W. N. Renouf, Clerk	Artillery, C.E.F.
Lieut. F. A. Richardson, Draughtsman	Royal Field Artillery.
*Lieut. J. F. Rowlands, Divisional Engineer	C.A.S.C., C.E.F.
Capt. C. R. Scharff, Clerk	29th Battalion, C.E.F.
Capt. W. G. A. Shadwell, Clerk	Royal Marine Artillery.

* Returned.

VICTORIA, B.C., March, 1918.

To His Honour Sir FRANK STILLMAN BARNARD, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of the Water Rights Branch of my Department for the year ending December 31st, 1917.

T. D. PATTULLO,
Minister of Lands.

WATER RIGHTS BRANCH,
DEPARTMENT OF LANDS,
VICTORIA, B.C., March, 1918.

The Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit herewith the report of the Water Rights Branch for the year 1917.

The report embodies a brief analysis of the work of the Branch and includes a report by the Chairman of the Board of Investigation.

I have the honour to be,
Sir,
Your obedient servant,

WILLIAM YOUNG,
Comptroller of Water Rights.

TABLE OF CONTENTS.

	Page.
Introduction	7
Organization	7
"Water Act"—	
Reference to Amendment in Reports of 1915-16	7
Rules and Regulations	9
Railway Belt	9
Indian Reserves	9
General—	
Surveys	10
Well-boring	10
Co-operation among Water-users	10
Bulletins and other Reports	10
Board of Investigation	11
General Office	11
Drawing Office	12
District Offices	12
Special Reports—	
Commission Investigating Irrigation Companies	23
Proposed Public Irrigation Corporation at Vernon	26
Datum-planes	28
Well-drilling	29
Meteorological Report	31
Appendices—	
No. 1. Water-powers of British Columbia	37
No. 2. Procedure for Applications for Water Licences	46
No. 3. Measurement of Water	48
No. 4. Grizzly Bar Diversion Headgate	51
No. 5. Headgates for Farmers	53
No. 6. Overirrigation	57
No. 7. Useful Data	58

REPORT OF THE WATER RIGHTS BRANCH.

VICTORIA, B.C., December 31st, 1917.

The Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to report on the administration of the Water Rights Branch of the Department of Lands for the year ending December 31st, 1917.

During the year administration has necessitated many trips by the Comptroller throughout the Province. Of these, mention might be made of the trip to Surf Inlet Mines, Pacific Mills at Ocean Falls, through the Okanagan Valley and Boundary country in company with the Minister, and to Creston to attend the Drainage Conference. Surf Inlet and Ocean Falls were reported on in full and covered matters some of which were outside the purview of the Water Rights Branch. The trip through the Okanagan Valley and Boundary country needs no further mention than that a similar trip should be taken through the Thompson, Nicola, and Similkameen Valleys and some sections of Lillooet and Cariboo. The Drainage Conference at Creston was of exceptional interest, in that representatives of Idaho and British Columbia met to consider what progress could be made towards the reclamation of the Kootenay Flats. A trip was taken to Ottawa in connection with the water-power situation in British Columbia. These trips away from headquarters to a greater or less extent interfere with the routine work of the office. It seems impossible, however, to arrange otherwise, at least not while the staff is at its present strength.

ORGANIZATION.

The year marks a decided change in the organization of the Water Rights Department. In the general reorganization of the Department of Lands all branches are again in the main building and are more or less consolidated. The Drawing Office now comes under the Surveyor-General, the Accounts and Stores Sections under a Departmental Manager, and the clerks under a Departmental Secretary; all of which will, no doubt, be referred to in the Deputy Minister's report.

The district offices for the year have been as follows: Nelson, Kamloops, Penticton, Vancouver, and Lillooet, the last-mentioned being temporarily established. The three first-mentioned offices have had a very busy season; the territory covered by each is large, and the Engineers in charge have been unable to fully cope with all the problems that have come to their attention. In respect of the Penticton office, it has been found advisable to move it to Kelowna, for the reason that some of the most difficult irrigation company problems of the district centre there. It is also more convenient to other centres where irrigation problems await solution. The Vancouver office was closed at the end of the year. While open it attended to all Lower Mainland matters, as well as being available for information in the largest centre of population in the Province. The office at Lillooet, temporarily opened this year, was established with the object of giving the many irrigation problems in the Lillooet and Cariboo Districts closer attention. It may be necessary next year to move it elsewhere in order to be more central in following up the work of those districts. As mentioned in my reports for 1915 and 1916, a District Engineer should be established somewhere on the line of the Grand Trunk Pacific Railway. If the requirements of the public are to be served and inquiries in respect of water-power, well-drilling, and applications for water rights intelligently answered, first-hand information of the water resources of that section is essential.

"WATER ACT."

The suggestions in respect of legislation outlined in the report for 1916 are still in order, with the exception of legislation to permit of the irrigation company problems being dealt with. The "Water Act Amendment Act, 1917," partially dealt with this and at the same time cleared up several points that stood in the way of co-operation in the use of works by several licensees. Under the sections enacted to deal with the company situation, it became possible, by Order in Council, to have a company put its operation account on a basis independent of capital account; in other words, it was possible for a company to give assurance to a bank that any advance for operation would be met from revenue to the exclusion of all other charges. Those sections also

empowered the Lieutenant-Governor in Council to appoint a Commission with wide powers to investigate and recommend a line of action whereunder a step forward could be taken in the solution of some of these problems.

Orders in Council were passed applying to the following companies: The White Valley Irrigation & Power Company, the Kelowna Irrigation Company, the Canyon Creek Irrigation Company, and the Peachland Townsite Company. Under these orders, maintenance and operation became a first charge against revenue to the exclusion of all other claims.

In the month of July a Commission was appointed, composed of J. S. T. Alexander, E. Davis, and F. H. Kidd, to report on the condition of the Peachland Townsite Company, Limited; the Peachland Real Estate and Fruit Company, Limited; the Westbank Irrigation Company; and the Okanagan Securities Company, Limited, at Naramata. The report of this Commission will be found hereinafter. Towards the end of December this Commission was again appointed to report on the Canyon Creek Irrigation Company. As the inquiry will take place in the coming year, a report thereon will appear in the next annual report.

While provision is made in these sections for financial assistance, such is not quite satisfactory; and since this legislation is a step towards public-utility law, it will be necessary to go further and enlarge the powers of the Board of Investigation so that it may act as a Public Utility Commission in all matters pertaining to or arising out of the use of water within the meaning of the "Water Act." It may be said to be almost imperative if the management of irrigation-works, whether under company or community, is to be to any extent successful. The examination of the business of some irrigation and waterworks companies reveals a very unsatisfactory state of affairs. If the necessary powers are given the Board, and "public utilities" defined to include such companies, an improvement in conditions must result in due course. Once the management of a system of works is reorganized, a standard form of book-keeping may be insisted upon and an annual audit made by a member of the Board, for it is obvious that if works are to be kept up and the obligation of the management lived up to, such is only possible through payment by the water-user of the tolls in each and every year.

Other amendments to the Act are necessary; of these, a number are merely corrections, while others are important. Of the suggestions referred to at the outset—viz., legislation for partial incorporation of small towns for waterworks purposes and in respect of artesian wells—both require attention. In respect of the first mentioned, the conditions in which some of the water companies are makes it imperative that provision be made whereby a district may incorporate for the purpose of taking over a system of works. It is only by spreading the obligations, so to speak, that such waterworks systems can be financed, for, as at present, a schedule of rates that would provide for not only maintenance and operation, but interest and sinking fund, would be prohibitive. All property benefited by the works should bear a share. The effect of such legislation will make possible the installation of waterworks in some districts which at present are unable to make any progress.

As to artesian wells, such might well be taken care of in legislation for direct aid by way of loan. In different British colonies, although operating under different laws, the principle is practically the same, and consists in boring wells partially at Government expense in parts of the country for farmers who are unable to provide the necessary equipment. The experience gained in 1916 and 1917 is such that provision in the Act may now be made that will assist in the development of many areas in which a wholesome supply of water can only be obtained by boring several hundred feet.

In studying the irrigation company problem, it is obvious that in one or more districts financial assistance will be necessary if communities are to be placed on a permanent basis. For a number of years there has been an agitation that the Government take over all these irrigation systems. It is now generally agreed that this would be, if anything, an uncertain step; one in which the future does not by any means seem clear. The alternative to this is that the Government take over main ditches and reservoirs. While even in this there are difficulties in the way in some instances, it is advisable that provisions be enacted which will permit of a step in that direction.

In the event of such legislation being adopted and the establishment of what might be called a "Conservation Fund," while the immediate object should be the conservation of those districts already reclaimed and largely settled under the irrigation companies, the fund might well be used in the extension of these systems and the reclamation of other areas by the construction

of reservoirs and main ditches. In the latter instance, wherever it is applied, it should follow only after careful survey, so that the charge per acre may be ascertained and a proper organization for management and repayment recommended.

Drainage might well come under such a fund. Apart from the fact that it is inseparable from irrigation, there are many thousands of acres of wet lands in the right of the Crown throughout the Province of which at least something should be known if development is to be encouraged. While a great deal of information has been secured on some of the larger areas, such as the Sumas and Kootenay Flats, there are many small areas that would be taken up were but reconnaissance surveys made and the information thus available to the public. It is manifest that such areas are more attractive than stump land, where the expense of clearing must be faced.

The irrigation community section must be amended. As it stands it is difficult, if not impossible, to work under it, though several communities have organized. They have brought the matter to our attention with recommendations that will meet their needs. Briefly, it may be summed up that if co-operation is essential, and we have already provided sections whereunder rotation may be insisted upon, then co-operation in the joint use of ditches and in the distribution of water should, under a community, be permanent rather than from year to year by tacit consent.

Rules and Regulations.

The amendments proposed for the rules and regulations in 1915 have been revised and submitted for the consideration of the Executive Council. It is important that these amendments be adopted, as under the proposed amendments accounting of irrigation fees and rentals become much simpler. As already stated in previous reports, the survey-construction feature does not work out in small irrigation licences, if there is to be any regard for promptness and efficiency in handling the accounts.

The power regulations have not been changed. While the principles established for the appraisal of water-powers in operation should stand, the matter of fees might well be reconsidered. Such, however, involves a question of policy which remains to be determined. One of the points to consider in the determination of policy is that it is not so much a matter of direct revenue by way of rentals as that of the indirect return that will follow from the industries and communities built up by reason of the availability of electrical energy. No better illustration of this can be had than the part the power-development at Bonnington Falls has taken in the building-up of Trail and Grand Forks, which, in turn, have been responsible for considerable agricultural development in their vicinities.

With respect to regulations for well-boring, it is essential that, before operations are undertaken in the coming year, rules and regulations to govern the use and operation of drills should be formulated and made effective. In the event that it is decided to go forward along lines similar to those under which the operations of 1916 and 1917 were conducted, regulations will require to govern procedure for securing a drill, the responsibility for operation, and the terms of hire. Under such there need arise no misunderstanding. Applicants will fully understand what will be expected of them upon entering into contracts.

Railway Belt.

Regulations for taking of lands in connection with water privileges in the Railway Belt have been prepared by the Department of the Interior. The particular object of the regulations is that there might be similarity in procedure for acquirement of either Dominion or Provincial Crown lands. The acceptance or approval of these regulations will immediately enable many conditional licensees to complete their procedure and obtain final licences. Another object in the preparation of these regulations was the bringing about of closer co-operation with Dominion officials in the administration of water in the Railway Belt. Early attention is accordingly essential in the matter.

Indian Reserves.

During the year many water matters on Indian reserves have received attention. With the co-operation of the Provincial officials of the Indian Department, considerable progress has been made towards bringing about a better understanding in the use of water. A number of reserves are so situated that co-operation of the Indians with white water-users is necessary. The Indian Department officials fully appreciate the advantages to be gained, and wherever necessary have

recommended and approved of the share to be borne by the Indians being taken up. The necessity for the appointment by the Indian Department of a competent Engineer to co-operate with Water Branch Engineers might well be urged. The right man could do much, not only in the clearing-up of disputes, but in teaching the Indians the science of irrigation.

GENERAL WORK.

SURVEYS.

During the last five years the greater portion of field-work has been in connection with records, that the Board might be in a position to adjudicate not only on title, but also on the use that had been made of such privileges. The importance of these surveys to the Board is well stated in the report of 1916. While there still remains some work to be done, it can be taken care of by the District Engineers.

The survey investigation of water-powers and water-supply, in view of existing conditions, cannot receive the attention it merits. In respect of land reclamation, however, in the light of the necessity of greater production, surveys must be carried on. Mention might here be made of the surveys at Pritchard and Ducks, where a large area of fertile land awaits but a supply of water to bring it under cultivation. Whether such lands are in the right of the Crown or alienated, the expense of surveys hitherto has been borne by the Department, although it may be assumed that, in the financing for construction, provisions will be made for repayment. For the future the matter of responsibility for cost of field-work should be first considered in each case.

With the exception of two parties, there has been no field-work during the year, other than that which has arisen out of administration in the several districts. The two parties in question were out but a short time—one in the Kamloops District and the other near Grand Forks. The first mentioned was engaged in a survey of available water-supply for the Pritchard District, as above mentioned; the other on similar work at Grand Forks. Reference to this work is made under reports of the District Engineers. Administration-work covered Board requirements and investigations in the interest of co-operation and on water shortage.

WELL-BORING.

The work of well-boring was again carried on throughout the season; one drill east of Prince Rupert, the other near Cranbrook. The terms on which these drills were operated are similar to those followed in 1916, being based on Australian practice, and which provided that the land-owner supplied fuel, oils, etc., for the drill, boarded the superintendent, and supplied the casing, the remaining charges being taken care of by the Department.

CO-OPERATION AMONG WATER-USERS.

No new water-users' communities have been formed during the year, although steps have been taken towards such in several districts. The Trepanier Water-users' Community has had difficulties, largely due to conditions arising out of the status of the Peachland Real Estate and Fruit Company. This company has been dealt with as herein mentioned, and it is now hoped that, upon the order arising out of the Commissioners' report being put into effect, the users will organize on proper lines, in which event there should be a satisfactory outcome.

The formation of irrigation corporations has again been mentioned in several places, while completion of corporations at Peachland and Naramata is still pending. Organization of water-users under the White Valley irrigation system at Vernon is being considered. In the last mentioned, E. Davis, Chief Engineer, is assisting the local committee. His report on the proposed corporation will be found hereinafter.

BULLETINS AND OTHER REPORTS.

Attention is directed to the annual report of R. G. Swan, Chief Engineer of the British Columbia Hydrometric Survey, for the year 1916.

In my report for 1916 it was intimated that the bulletin on hydrometric data was ready for the printer. It was eventually decided to let the issue stand over for a time.

A revision of Bulletin No. 44 on irrigation, issued by the Department of Agriculture in 1912, is in hand and should be ready for the printer at an early date.

The report of the Commission of Conservation on the Water-powers of British Columbia will be published in 1918.

BOARD OF INVESTIGATION.

The Chairman of the Board of Investigation, J. F. Armstrong, submits the following report of the work of the Board:—

"*Determinations of Water Rights granted prior to March 12th, 1909.*—Preliminary hearings in regard to all of these claims, over 7,000 in number, have been held; the result in the 580 cases heard during the year 1917 being that 165 have been confirmed, 309 cancelled, and 106 were adjourned either on account of claims not having been filed or because further information was required. During the year, 833 formal orders were issued, 469 being directions to issue licences to replace the records and 364 being cancellations of records. It is estimated 3,479 orders have yet to be issued, of which about 550 are for rights claimed by the different Indian Agents.

"*Readjustments of Water Rights granted between March 12th, 1909, and February 27th, 1912.*—During this period the District Water Commissioners issued 961 water licences, and unfortunately many of these, though honestly made, are incomplete or irregular, and the Board has authority to amend them or replace them by licences consistent with the 'Water Act, 1914.' Of these, fifty-four have been cancelled and thirteen have been replaced by licences. There remain 584 which can be readjusted as occasion requires.

"*Authorities to improve Streams granted under the 'Rivers and Streams Act.'*—A notice as required by section 295 of the 'Water Act, 1914,' was published in the Gazette of April 5th, 1917, calling on forty-one persons, firms, or companies to file claims regarding any rights they might have under that Act. Only four claims have been filed and the authorities granted in the other thirty-seven cases can now be cancelled."

GENERAL OFFICE.

The report of the General Office is on the same lines as that of last year; that is to say, statistical. A further reduction in staff has taken place, which may be noted in the comparison with last year and at the time the war broke out. In respect of the clerical staff and draughtsmen, the former have been placed in the General Office of the Lands Department, and the draughtsmen under the Surveyor-General.

INSIDE STAFF.

	July, 1914.	Dec., 1916.	Dec., 1917.
Executive	4	3	3
Clerks and stenographers	26	15	4
Draughtsmen	12	6	..
Engineers	3	2	2

OUTSIDE STAFF.

	July, 1914.	Dec., 1916.	Dec., 1917.
District Engineers	7	4	4
Divisional Engineers	2	..	..
Field Engineers	4	3	2
Assistants	6	2	3

APPLICATIONS RECEIVED, ETC.

Applications for licences under Part V. of the "Water Act" which were received and disposed of during the year are shown in the following statement: Applications received, 197; licences issued, 245; authorizations issued, 9; applications lapsed, withdrawn, or cancelled, 69.

It will be noted that the total number of applications disposed of is 323, being a gain on pending applications of 128. This is an improvement on the previous year, where the gain on pending applications was only seventy-seven, the total number received in that year being 231, and the total number disposed of 303.

REVENUE FOR YEAR ENDING DECEMBER 31ST, 1917.

Purpose.	Application Fees.	Rentals.	Total.
1. Power	$4,323 65	$10,403 23	$14,726 88
2. Irrigation	783 10	3,383 85	4,166 95
3. Miscellaneous	106 75	2,704 08	2,810 83
4. Mining	91 25	2,411 11	2,502 36
5. Clearing-streams	25 00	984 38	1,009 38
6. Storage	428 50	441 25	869 75
7. Waterworks	17 00	771 29	788 29
8. Steam	16 50	144 49	160 99
9. Domestic	45 50	114 28	159 78
10. Fluming	55 00	51 55	106 55
11. Lowering-water	10 00	4 00	14 00
12. Hydraulicking	...	...	...
13. Conveying	...	...	...
14. Mineral-trading	...	...	...
15. Certificates of approval	250 00	...	250 00
Totals	$6,152 25	$21,413 51	$27,565 76

The total application fees and rentals for the year ending 1916 was $63,464.60.

It is expected that the revenue for the coming year will approximate that of 1916, as payment of a number of large accounts owing are under consideration.

DRAWING OFFICE.

The work of the Draughting Office has continued along much the same lines as before. The necessary water-rights maps for Board purposes have been prepared, and it has been found possible to do a little toward the revision of those drawn for the meetings in 1913, which do not show the Crown-granted lands to date. A considerable amount of work has also been done in reducing railway right-of-way plans to enable them to be shown on the water-rights maps.

A complete series of township maps in the Railway Belt has been procured, and thoroughly cross-indexed with the water-rights maps.

All applications have been carefully searched to make sure that all live ones are shown, and the licence-books have been rechecked for the same purpose.

A new index of Engineers' field-books has been compiled.

The question of the right-of-way over Dominion and Provincial Crown lands for ditches, etc., came up for more particular attention this last year, and a set of 200 water-rights maps showing all works was prepared and forwarded to the Dominion Land Agent, so that when applications for lands in the Railway Belt are received, any works in existence or proposed affecting them may be on record. The same matter attained a greater degree of importance in this office in regard to Provincial Crown lands, since under a new arrangement applications for land will in future come before this Branch for clearance, and it is important that the location of the works should be known, as well as the source of supply under the licence, and the land to which the licence is appurtenant. This work is now in hand.

Between 500 and 600 files covering applications and licences have been dealt with during the year, and, besides several smaller plans of works, those submitted in connection with two of the largest power schemes in British Columbia have been carefully examined as to their agreement with the requirements of the "Water Act," and further information asked for accordingly.

DISTRICT OFFICES.

NELSON.

W. J. E. Biker, A.M.Can.Soc.C.E., submits the following report for the Nelson District:—

"The end of the year completes three years' work under war conditions, and for several reasons has been more trying than usual.

"The year 1917 will go into the records as one of the driest summer's experiences, and many farmers had little or no crop to reap. When such conditions prevail and water becomes a vital necessity, the individual water-user may sometimes be pardoned if, in his extremity, he may

sometimes be guilty of ignoring the rights of others who are equally vitally interested. It is unnecessary for me to point out the unpleasantness of making a division of water or settling a dispute between parties when a crop may hang in the balance.

"This district has been enlarged over three times in area since the war began, and the staff has been reduced. Under present means of transportation it takes two days to cross the district in an east and west direction, and three days in a north and south direction. At intervals it is necessary to have two men ready to go into the field to handle disputes, and at the same time the work of the office has to be kept in line.

"In spite of the very serious set-back created by the strike at Trail, we may look for many applications for power-development suitable to mining operations. There are now between fifty and sixty hydraulic equipments in the district successfully supplying power for mining purposes.

"It will be noticed that the applications for clearing streams and fluming rights have increased. A good deal can be said in favour of the flume as a cheap means of transportation. Naturally, the most accessible timber has been removed first, but we are gradually arriving at a condition when it seems good business to erect or install a portable mill on the limits to be logged off, and transport the cut lumber (or even logs) by flume to rail-head.

"Flumes for logging purposes, with average topography, can be built at a cost for labour ranging from $1,900 to $2,600 per mile, according to local conditions, and those for fluming lumber can be built as low as $1,600 per mile under the best conditions. There are flumes in this district constructed through what would appear to be impassable canyons and over the worst kind of topography. Therefore, it can be said that when properly laid out the logging or lumber flume is one of the most flexible and successful means of transporting logs and lumber from limits in mountainous country that would otherwise be considered impossible at the present market prices of lumber.

"In September of this year an invitation was accepted from Dr. Young, Secretary to the Board, to give a paper before the Medical Health Officers in convention at Vancouver on 'Rural Sanitation.' The paper is to be published in the Annual Report of the Provincial Board of Health.

"With the exception of a few special investigations, such as Kootenay reclamation, sanitation, well-drilling, Grand Forks irrigation project, and a dispute between the West Kootenay Power & Light Company and the City of Nelson at Bonnington Falls, the staff has spent almost all its time in the work of administering the details of the 'Water Act.'

"At intervals during the last four years we have made studies and taken meterings of the water diverted by the power plants of the City of Nelson and West Kootenay Power & Light Company at Bonnington Falls. In the late fall of 1915 some apprehension was shown by the Mayor and officials of the city that an extension of the forebay crib by the West Kootenay Company (then under construction) would have the effect of decreasing the cross-sectional area at the crest of the falls, thereby giving an unknown additional impounding effect at extreme high water, and when considered in terms of an 1894 flood would leave them with a small margin of safety from the danger of overtopping

"In the spring of 1916 a report and plan of the extensions were submitted for your consideration, and after interviewing the Mayor and City Electrical Engineer it was decided to study the effect through the 1916 high water. This was done, and when it was found to only increase the head-water by about 0.2 foot they were satisfied.

"In the fall of 1916 the West Kootenay Power Company were delivering almost as much electrical energy as they could produce under the most favourable 'head' conditions, and had to face carrying an increasing load with a decreasing head at next high water. The management had a serious problem to face to keep the wheels going to meet the war demand for metals. With this in view, they decided to carry into effect a charter granted in 1905 under the provisions of the 'Water Clauses Consolidation Act, 1897.' Incorporated in the charter amongst other items was permission to erect a dam at the headworks, commencing at their own forebay and extending across the river to connect up to the forebay of the city's plant. The exact wording of the paragraph in the charter under which the company were operating is as follows:—

"'The West Kootenay Power & Light Company, Limited, are hereby permitted to construct a dam commencing at a convenient point upon the site of their works now in the course of construction at the said Upper Bonnington Falls; thence up-stream, following, as closely as conditions will permit, a rocky reef extending from such falls; thence to a suitable point at

Lot No. 5282, being the property of the City of Nelson; thence from a convenient point by a wooden dam, not exceeding in height the height of the wall to be erected by the City of Nelson from their proposed works on said Lot No. 5282, to a junction with the wall proposed to be erected by the City of Nelson according to plans as now approved; all said works to be so constructed as to permit the free passage to the works of the City of Nelson of 51,000 inches of water now recorded by them.'

"The work on the dam had progressed almost across the river, and the company were on the point of connecting up to the city's forebay when again the Mayor and Aldermen were somewhat perturbed as to the effect of the dam at high water. The position taken up by them was a reasonable one and called for some explanation. In an endeavour to arrive at a working basis for all time, engineers from the city, Power Company, and Government visited the works on February 17th, 1917. A working basis was amicably arrived at, the limitations of which were set forth in an order made by the Comptroller on the 23rd. This office was called upon to make surveys, soundings, etc., and particularly to closely study the effect of the dam through 1917 high water. Four sets of gauges were set up and continuously read; from this data comparisons were made of equal (or nearly so) heads, irrespective of date, for 1916-17. (The tabulated results of these findings will be found in this report.) A study of the comparisons give the following findings in brief:—

"First: There is an increased head at both plants for low-water stages.

"Second: Contrary to expectation, there is a decrease in the elevation of the head-water at both plants at the flood stage. This is accounted for in the following way: In carrying out the work the company removed some rock islands in the channel on the brink of the falls, which originally offered more retarding resistance to the get-away than the new dam now exerts.

"Third: That the work done below the falls in removing the islands has helped the get-away, but much more can be done in this regard. Also, the company, to be able to take full advantage of this work, should improve the crippled condition of their own tail-race.

"Fourth: That the improvement in tail-race conditions is much more noticeable on the company's side, as compared to the works of the city. This was to be expected, owing to the construction of the city's draught tubes not lending themselves to take advantage of the increased get-away.

"Fifth: There is a limit to the improvements that can be made to both head- and tail-race conditions, and judged from a cost view-point, the percentage improvement for money spent is greatly in favour of the tail-race.

"The result or gain derived from the work undertaken by the company to date, in terms of head, means that every cubic foot per second of water going through the plant, on the basis of 1917 conditions, has an enhanced value (or power) of 4.95 per cent. at low water and 1.20 per cent. at high water.

"There is a slight drawback (in the dam as at present constructed) to the City of Nelson's intake; since it is of the closed type, it was anticipated by the Department that gravel and debris would be deposited in the city's intake canal. The soundings taken before and after high water have proved this contention to be an accomplished fact. A little over 500 cubic yards of gravel have been deposited in one year, and it now remains for the company to deal with this matter to the satisfaction of the city and Government.

"Arrangements are now in hand for constructing a submerged weir at such an angle to the flow of water that it will convey all gravel to a sluice-gate to be inserted in the concrete forebay wall, discharging over the falls.

"*Power Plant of the West Kootenay Power & Light Co., Ltd.—Water-level Comparisons at Upper Bonnington, showing Effect of Dam built by the W.K.P. & L. Co., Ltd., 1916-17.*

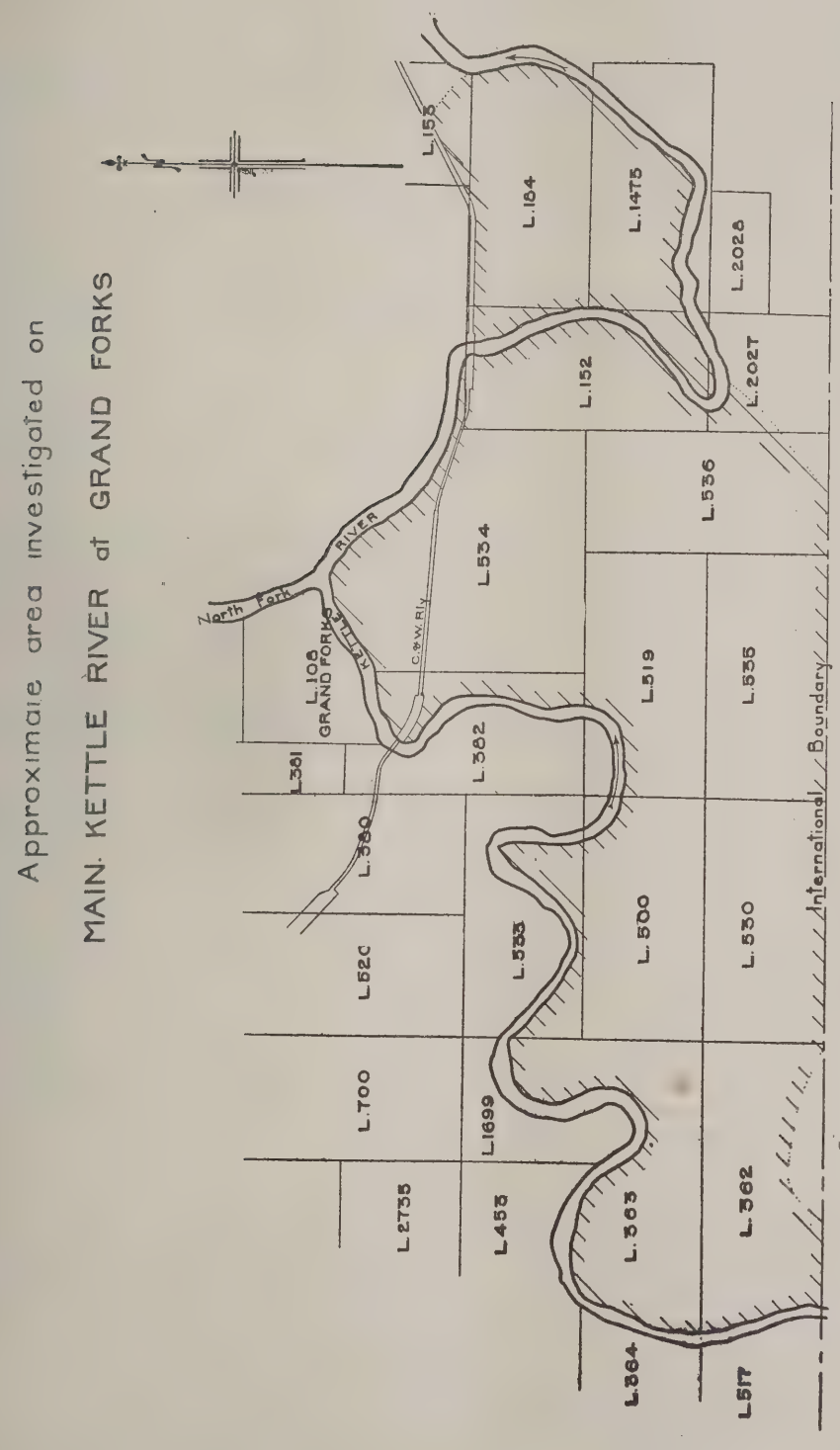
"Dam was constructed during the fall of 1916 and spring of 1917. This data has been compiled from elevations supplied by the West Kootenay Power & Light Company, Limited.

Date.	Nelson Gauge Height.		W.K.P. & L. Operating Head.		Head-race Gauge Height.		Difference in Head at Head-race.		Tail-race Gauge Height.		Difference in Head at Tail-race.		Actual Difference in Total Head.	
	1916.	1917.	1916.	1917.	1916.	1917.	1917.		1916.	1917.	1917.		1917.	
							Plus.	Minus.			Plus.	Minus.	Plus.	Minus.
March 19..	1.0		64.41		188.16				123.75					
							1.84				1.35		3.19	
April 15...		1.0		67.60		190.00				122.40				
May 30 ...	10.0		61.67		195.92				134.25					
								0.02			0.85		0.83	
May 25 ...		9.85		62.50		195.90				133.40				
June 9	11.2		61.26		196.92				135.66					
								0.12			0.86		0.74	
May 28 ...		11.3		62.00		196.80				134.80				
June 19 ...	16.4		59.58		199.83				140.25					
								0.23			0.95		0.72	
June 24 ...		16.3		60.30		199.60				139.30				

"*City of Nelson Power Plant.—Water-level Comparisons at Upper Bonnington, showing Effect of Dam built by the W.K.P. & L. Co. Ltd., 1916-17.*

"Dam was constructed during the fall of 1916 and spring of 1917. This data has been compiled from elevations supplied by the City of Nelson.

Date.	Nelson Gauge Height.		City Plant Operating Head.		Head-race Gauge Height.		Difference in Head at Head-race.		Tail-race Gauge Height.		Difference in Head at Tail-race.		Actual Difference in Total Head.	
	1916.	1917.	1916.	1917.	1916.	1917.	1917.		1916.	1917.	1917.		1917.	
							Plus.	Minus.			Plus.	Minus.	Plus.	Minus.
March 19 ..	1.0		61.30		188.35				127.10					
							1.70				0.10		1.80	
April 15 ..		1.0		63.10		190.10				127.00				
May 30 ...	10.0		61.00		196.35				135.36					
								0.77			0.36			0.40
May 25 ...		9.85		60.58		195.58				135.00				
June 9 ...	11.2		61.00		197.30				136.30					
								1.00				0.20		1.20
May 28 ...		11.3		59.80		196.25				136.50				
June 19 ...	16.4		58.70		199.90				141.20					
								1.74			0.40			1.30
June 24 ...		16.3		57.40		198.16				140.80				


Approximate area investigated on
MAIN KETTLE RIVER at GRAND FORKS
L.155
L.164
L.1475
L.2028
L.2027
L.152
L.536
L.534
North Fork
KETTLE RIVER
C.P.R.Ry
L.105
GRAND FORKS
L.361
L.382
L.519
L.535
L.380
L.522
L.533
L.500
L.530
L.700
L.1699
L.2735
L.455
L.363
L.362
International Boundary
U. S. A.
L.364
L.517

"According to your instructions, J. F. Rowlands and myself visited Grand Forks for the purpose of making preliminary investigation upon the feasibility of two projected gravity irrigation schemes.

"Through the courtesy of the railway companies loaning profiles of their roads which parallel the two streams under consideration and the West Kootenay Power & Light Company, we were enabled, after an inspection of topographical conditions, to arrive at the following conclusions regarding the North Fork proposal:—

"(1.) To obtain fall sufficient for a ditch to cover an approximate area of 3,500 acres, it would be necessary to divert the water at a point fifteen miles up-stream.

"(2.) As most of the land to be served is on the south side of the Kettle River, the main ditch would not be less than seventeen miles long, terminating with a siphon probably 4,000 feet long.

"(3.) The nature of the country through which the ditch has to be constructed is broken, rocky, and steep, and undoubtedly would require a large percentage of fluming, or, in other words, high initial and maintenance costs.

"(4.) There is not an ample supply of water during the irrigation season, in view of the appropriations already made, including that of the Granby Consolidated Mining & Smelting Company.

"(5.) The heavy initial cost of the main ditch itself would impose too much of an overhead charge per acre upon the land benefited, thereby eliminating the scheme from further consideration.

"After four days' collaboration in the field with Mr. Rowlands, he was left to pick up all available preliminary data on the main river proposal, since the comparisons of levels on first showing applied to an assumed estimate of cost gave us hopes that a scheme would be economically feasible.

"Regarding the main Kettle River gravity scheme, the following conclusions have been arrived at:—

"(1.) From levels supplied by the Great Northern Railway and Mr. Gibson, of the West Kootenay Power & Light Company, a point of diversion might be obtained about ten miles up-stream from Carson's Bridge, on the south side of the river, giving sufficient elevation to irrigate approximately 3,670 acres.

"(2.) The diversion point and eight miles of ditch are in United States territory; also 500 acres of United States land could be served. The international problem as to diversion and right-of-way could surely be made one of mutual interest.

"(3.) There is an ample supply of water in the river, and although it is suggested to divert the same in United States, 97 per cent. of the tributary watershed of the river is in British Columbia.

"(4.) At the time of the investigation 10 inches of snow covered the ground, making it difficult to estimate with accuracy the ultimate cost. However, it is thought possible that a scheme could be worked out on the acreage given to come within a per acre annum overhead charge of $5.

"(5.) On the basis of present findings the preliminary estimates exceed this figure, but it is thought (with every confidence), through the co-operation of the land-owners in United States, to bring the scheme well within the above figure. This possibility appears to justify a certain amount of field-work being done in 1918."

KAMLOOPS.

C. Varcoe, A.M.Can.Soc.C.E., District Engineer, submits the following report for the Kamloops District:—

"In making my sixth annual report, attention is respectfully called to the vast changes in our work when compared to the earlier years of our existence as a branch of the Department of Lands. For years our work was largely one of tedious investigation of old water records, and not until the last two years have we been able to study to any extent the order of work laid out for us in the 'Instructions to Field Parties' issued in 1912.

"During the earlier part of the year the plans and reports on the Campbell and Peterson Creek watershed were completed and forwarded to Victoria. This work, taken up in 1916 at the instigation of the Board, is in line with the aforementioned instructions, and its ultimate

value to the district is unquestionable. For the balance of the year the work might be put under classifications: (1) Administrative; (2) field-work; (3) the prevention of wilful waste of water; (4) the division of water; (5) inspections of systems to determine their efficiency and safety, which included the inspection of various storage-dams. The field-work consisted largely of surveys in connection with a proposed public irrigation corporation for the lands situated on the South Thompson River and extending from about three miles west of Ducks to the Shuswap Indian Reserve; contour surveys of Scuittoe and Campbell Lakes were also made to complete the storage data on the Campbell Creek watershed. These matters will be referred to later.

"In a district of this size there are and will always be difficult streams to administer, but with a proper use of water bailiffs appointed under the Act or by mutual consent of the parties interested a large part of the difficulty is obviated. A certain amount of success followed the efforts of the water bailiffs this season on Sullivan and Paul Creeks, and the practice is recommended for other streams. On Laluwissin Creek, in the Ashcroft District, dividing weirs were installed which gave considerable satisfaction; on Paul Creek an automatic division was also successful.

"On the recommendation of H. Rindal, Division Engineer of the Canadian Pacific Railway, a joint inspection of dams situated south of the Thompson River between Kamloops and Ashcroft was made, H. B. Walkem representing the Canadian Pacific Railway. The dams inspected to date are on the following reservoirs: Dominick, Tunkwa, and Leighton Lakes, on the headwaters of Durand or Three-mile Creek; Barnes, Willard, and Separating Lakes, taking their supply from Barnes or Ashcroft Creek; East Dairy, Big Dairy, and Beaton's reservoir, tributary to or taking their supply from Dairy Creek. Examinations of dams in which the Canadian Pacific Railway are not interested were also made—viz., Monte, Little Disdero, Knouff, and Cornwall Lakes—and a reservoir on the upper waters of Laluwissin Creek. In some cases it was found necessary in the interest of public safety to issue orders for repairs or alterations to the dams. Where these orders have been issued the work called for has been done, or the licensee or licensees have agreed to comply before another season.

"With one or two exceptions, the stream-gauging has been carried on by the British Columbia Hydrometric Survey, and their hearty co-operation is very much appreciated. This season a number of weir-stations have been installed by them on the smaller streams, replacing the former indifferent meter-stations.

"A word of commendation to the Heffley Creek Water-users' Community is not out of place. Since taking charge of the district no complaint has been made to this office by any member of the community, and if the water-users on other streams would only organize on a similar basis, much of the trouble now existing would be a thing of the past.

"The proposed public irrigation corporation, which might be termed the Pritchard-Ducks project, provided the main field-work. Until the plans are prepared it will be impossible to give any definite information as to the entire feasibility of the scheme or the acreage that may be included, but a rough outline of the project follows: Between Kamloops and Shuswap along both sides of the South Thompson River lies some of the finest agricultural land in the Dry Belt, an estimated area of 15,000 to 20,000 acres. Parts of this area are under irrigation, but the present sources of supply are inadequate for the whole of the land. For years the settlers in the vicinity of Pritchard and Ducks have been under the impression that an additional supply might be obtained by diverting Bear Creek, a tributary of Adams River, into Loakin Creek, thence along the natural channel of the latter to Nisconlith Lake. The field-work included surveys between Bear and Loakin Creeks, and a 10-foot contour survey of close on 10,000 acres situated between the Shuswap Indian Reserve and a point about three miles west of Ducks. If the water-supply is proven to be adequate, it appears that a valuable area can be brought under irrigation at a nominal cost per acre.

"The contour surveys of Campbell and Scuittoe Lakes were undertaken to complete our information of the storage available on the Campbell Creek watershed. Both lakes are suitable for storage, and the run-off as measured for a portion of the year at the new gauging-station on Scuittoe Creek indicates that these lakes may become a considerable factor in the future development of the lands tributary to Campbell Creek. The recorded run-off from June 1st to September 30th amounted to 4,740 acre-feet.

"It is of interest to note an increase in the number of pumping plants for irrigation purposes in the vicinity of Kamloops. For the season of 1917 the City of Kamloops provided electric power for six pumping plants. Five of these plants were on a flat rate of $1 per acre per month, the city furnishing the transmission-lines and transformers. On the other project the owners erected the transmission-line, the power rate being 1½ cents per kilowatt-hour. East of Kamloops, on the South Thompson River, three or four pumps operated by oil-engines have been in use for several seasons. Figures giving the operating costs have been furnished by the Western Canadian Ranching Company and A. R. Goodwin. The rated capacity of the Western Canadian Company's plant is 1,000 imperial gallons per minute, and it consumes about 25 gallons of 'Star' fuel-oil per day of ten hours at a cost of 12 to 15 cents per gallon; Mr. Goodwin's plant has a rated capacity of 600 imperial gallons per minute, and it consumes about 10 gallons of the same kind of fuel in a similar period. It was hoped that a comparison of the cost of the various plants on the basis of an acre-foot lifted 1 foot high could be made, but the data available are insufficient. A thorough investigation into the pumping questions during the coming season is respectfully recommended."

OKANAGAN.

F. W. Groves, M.Can.Soc.C.E., reports as follows for the Okanagan District:—

"Last summer was a very dry season, one of the driest since 1908, there having been no June or September rains; the drought was also intensified by an almost continuous wind which blew up or down the Okanagan Valley all summer and parched the ground worse than the sun.

"As there was more land under cultivation than ever before, and a large amount of same planted in onions, tomatoes, and truck, all of which require a great deal of water, there was a very great and excessive demand for irrigation-water by all the farmers in the valley.

There has been only a very average snowfall in the mountains for the last three or four years, and on account of the lack of the June rains, the small snowfall, and the hot winds, the flow of all the streams draining into Okanagan Lake and Valley dropped suddenly about the middle of July, causing a great shortage of water and a consequent heavy draught on all the storage systems, which, with only two exceptions, failed to supply the requirements of the lands depending on them, some giving out the first week in August and others about the middle of August.

"In the Rutland, Ellison, and Glenmore Districts there was considerable loss of crops through the shortage of water, several ranchers estimating their individual loss at from $1,500 to $2,000, and the weight and size of the apple-crop was considerably reduced in these districts, and also at Naramata and South Okanagan.

"At Naramata the ranchers sent men into the mountains to open up a small lake, but they put off sending up the men till so late in the season that they derived very little benefit from the work, as much of the water was lost coming down in the dry bed of the stream and by evaporation. They also repaired the community reservoir dam which broke three years ago.

"One result of last summer's drought will be that most of the companies supplying water will in the future install measuring-boxes at the point of supply to all users. This, though it may work an apparent hardship on some, will be a benefit to the country at large, as it will check the great waste of water that takes places all over the valley, and compel those who use an excessive amount of water (and they are many) either to reduce their consumption or pay a rate proportionate to the amount of water that they use.

"It also had the effect of waking up the land-owners and water-users on private systems to the necessity of constructing storage-reservoirs and constructing water-tight flumes and ditches, and brought home to the various irrigation companies and municipalities the absolute necessity of increasing the capacity of their storage-reservoirs.

"The owners of 1,000 acres of land to which the waters of Scotty Creek are appurtenant constructed an earth dam at the outlet of a large meadow near the headwaters of Scotty Creek, capable of storing about 250 acre-feet. The cost of this dam was slightly over $2,000 and was subscribed by the land-owners themselves. The construction of this work was superintended and a considerable amount of reconnaissance-work was done around the upper portion of Scotty Creek watershed. It was found that by the construction of six small dams across the outlets of several small lakes and meadows at least 1,000 acre-feet of water can be stored in this watershed. It is the intention of the Scotty Creek water users, to eventually develop this storage to the utmost by constructing a new dam every year.

"As there is a very great loss of water in the network of private flumes at the mouth of Scotty Creek—from 50 to 75 per cent., according to the amount of water flowing—it will be necessary for these users to consolidate their ditches and replace them by flumes. This work should be done next spring.

"The Kelowna Irrigation Company started to build a second reservoir dam at the outlet of South Lake at the headwaters of Mill Creek, but owing to the lateness of the season when the work was started (October 1st) and the impossibility of getting suitable labour, very little progress was made with the work, which was closed down on November 2nd. This site would, if developed to its full capacity, store about 419 acre-feet. Levels were run and what engineering advice was necessary was supplied in connection with this work, and considerable reconnaissance-work was done around the watershed of South Lake.

"On account of excessive rusting and pitting of the interior of the Kelowna Irrigation Company's steel siphon across the valley of Mill Creek, the company let a contract this fall to the Nag Paint Company to scrape and paint the interior of this pipe. The contractors have completed this work, although they have been considerably hampered by lack of labour.

"The steel flumes were inspected on the Glenmore system of the above company this fall. They were found in many cases very badly rusted, and when scraping them with a pocket-knife the knife would break through the steel. The company started to scrape and paint these flumes, but owing to shortage of labour and starting the work late they only got 200 feet of the work done, when they had to stop on account of the weather.

"The Penticton Municipality did certain repairs and betterments to their Penticton Creek and Ellis Creek reservoirs with a view of increasing their capacities.

"Considerable time in the late summer and fall was taken up in apportioning what water was in the streams among the licensees, and trying to convince those who have had practically an unlimited supply of water in past years that they had to limit themselves to a flow at the rate of 2½ acre-feet per acre.

"It is advisable to bring before you the necessity of enforcing section 24 of the 'Water Act,' and compelling all water-users to install proper headgates, capable of being locked, and measuring-devices at their points of diversion. There is to be found a total absence of measuring-devices at all the headgates in the valley, and no way of locking and only very crude appliances for raising or lowering these headgates. This is a great hindrance in the execution of administrative work and a cause of considerable expense to your Department, as it necessitates constructing temporary weirs or metering the ditches.

"Considerable time was taken up investigating possible means and sources of increasing the flow-streams by diverting other streams into them, increasing the capacity of existing reservoirs, and investigating new storage-sites. Investigations were made and a grade-line run for a ditch to divert the waters of Lake Brenda, which drains into Penask Lake, so that they would flow into Deep Creek, and so augment the supply of the Peachland water-users.

"The repairs to the Trepanier Water-users' Community system were superintended early in the season.

"Gaugings were taken on all creeks where weirs and gauging-stations had been installed as in 1916, except on Sawmill Creek, where it was impossible to get any one to take the readings, and on Powers Creek, where the gauge was washed out in high water. A new measuring-weir was established on McDougal Creek, on Mr. Gellatley's dam, but owing to the action of the Indians, who refused to allow the gauge-reader to take readings or set up the gauge, no discharges have been taken at this station. A Cippoletti weir was constructed on Scotty Creek a few hundred feet below the dam constructed by the water-users; their weir, which has a 5-foot crest, was only constructed late last fall."

Vancouver.

W. R. Pilsworth, M.Can.Soc.C.E., Engineer, submits the following report for Vancouver District:—

"In consequence of economical restrictions, operations in the field have been greatly restricted, and therefore a report on the year's work will be of less interest than in the past, when parties were in the field and much survey-work was in progress.

"Personal investigations were, however, made and reports thereon sent in on various complaints and disputes, which in most cases have been brought to a satisfactory conclusion.

"An inspection and superficial survey was made of Abbotsford Lake on the application of the Abbotsford Timber and Trading Company for permission to raise the water of the lake to its normal level to facilitate the storing of their logs. This application was objected to by a resident on the lake, but upon inquiry and evidence received from other residents the objection was overruled, and permission was granted to the company under certain restrictions and conditions. The dam and dykes constructed by the company in compliance with these conditions were inspected and accepted as being in accordance with the plans and specifications.

"Inspections were also made at Coquitlam and reported upon, also at Sullivan and Hollyburn, where disputes were settled.

"An inspection of the flume constructed by the Vedder River Shingle Company was made, and an approximate estimate of rental to be paid for easement through various lots on which the flume was constructed, which was acceptable to the parties concerned.

"Investigation was also made in the vicinity of Cloverdale, where several of the settlers were desirous of forming a water-users' community; with this in view, application had been made for Government assistance in drilling a well. This application after investigation of the merits of the case was recommended, but unfortunately the Government drills were employed at distant places in the Province and were not available; this is to be regretted, as the scarcity of water in the summer is a serious drawback to the settlement.

"Personal investigation was also made at Squamish, where the people of the town were desirous of taking over the pumping plant which supplied the town with water, and which was about to be abandoned by the water company as it was no longer a paying proposition. This matter is still, it is assumed, under advisement.

"The daily routing of the office correspondence, filing and indexing of licences, etc., need not be more particularly mentioned here, but almost daily applications are made for guidance and information in matters pertaining to the Water Rights Branch."

LILLOOET AND CARIBOO DISTRICTS.

W. C. Smith, A.M.Can.Soc.C.E., submits the following report for the Lillooet and Cariboo Districts:—

"The districts cover a very large area of thinly settled mountainous country. Travelling is both slow and very expensive. The actual distances covered in the season's work are as follows: By rail, 850 miles; by automobile, 2,275 miles; and by saddle-horse, 265 miles.

"Last year with the district office at Quesnel a considerable amount of work was accomplished in the Cariboo District. This year only a few isolated cases involving trouble or dispute have arisen in that country, which usually provides many water problems owing to the extensive use of water in placer-mining in the vicinity of Barkerville, Quesnel Forks, and Harpers Camp, and for irrigation, domestic, and power purposes in the agricultural areas south of Quesnel.

"The present year has been very favourable with regard to water conditions in Northern Cariboo. A number of the gold-mines were able to operate for 100 and even 120 days, whereas the water usually lasts for little more than half that period. This was due to the extremely heavy snowfall of last winter, followed by the summer and fall rains. These conditions also helped the farmers very materially. Many creeks that have been dry for years carried water this year, and lakes that have fallen below their outlets for years provided good streams in the spring and ample storage for the late summer. Dragon Lake, near Quesnel, is a notable example.

"The Board of Investigation held meetings at the 150-Mile House, Soda Creek, Alexandria, and Quesnel in the month of May last, and completed the hearing of all the old water records in the district. In all, 175 records were dealt with, on all of which reports were submitted in 1916.

"Unlike the Cariboo District, the Lillooet District this year experienced a season of excessive dryness and extreme heat. The snowfall last winter was very light, and practically no rain fell during the whole of the irrigation season. The temperature ranged steadily during nearly the whole of July and August from 85 to 105 degrees in the shade. These conditions combined to make irrigation-water very necessary and at the same time very scarce.

"Many disputes were adjusted which required the construction of new ditch-head works, including boxes, gates, measuring-weirs, spillways, etc. These were designed and the work supervised. A great deal of this type of work must be undertaken in the district to facilitate the handling of many difficult cases in the future.

"The services of a water bailiff were required this year to regulate the waters of Alkali Lake Creek, where a somewhat aggravated situation had obtained. Diversion and measuring works were designed for all ditches. These the water bailiffs constructed, regulating the flow thereby, and kept a record of the flow in all ditches. His work has given some very useful data, besides relieving the tension over water matters in that locality. In this instance a co-operative storage scheme is the only solution to an annual recurrence of trouble, as the normal summer flow is not nearly sufficient for the land irrigated. Several storage-reservoirs might be created at reasonable expense. The most promising site, however, appears to be at Alixton Lake. It is expected that the Alkali Lake Indians will co-operate with the ranchers interested in the development of this storage, as much of the trouble has been caused by the Indians, who have no water privileges as yet.

"There are several other situations where the Indians are vitally interested in better water conditions, notably at the Williams Lake and the Fountain Creek Reserves. At Williams Lake the normal flow of Valley Creek, 150-Mile Creek, and Five-mile Creek is insufficient for the requirements of the ranchers and the Indians. The situation would be considerably improved if the Indians were to divert freshet water from the 150-Mile Creek and convey it to a larger natural reservoir on the reserve. The work would ensure at small cost an adequate water-supply for the Indians independent of other interests. Ranchers have already developed considerable storage on Five-mile Creek, and the Cariboo Trading Company wish to considerably increase their storage on Valley Creek.

"Fountain Creek, near Lillooet, is also overrecorded. The Indian reserves and the 'Indian improved lands' constitute a large area requiring a large quantity of water. The Fountain Ranch and several other smaller ranches also derive their water-supply from this stream. The Indians have a storage-dam at the outlet of Fountain Lake which assists the low-water flow considerably. However, the dam is an old structure and the outlet-gate is very unsatisfactory. The whole structure should be replaced by a larger dam, with two or more outlet-gates for the different holders of storage privileges co-operating in the work of construction. It is probable that before another season has passed an agreement will be arrived at between the parties interested and an unsatisfactory state of affairs ended.

"In conformity with the present increased interest in land production, the Indians are making much better and more extensive use of their lands. This, of course, adds to their water requirements considerably and was responsible for many requests for adjustment of water disputes during the year.

"The question of water-supply for lands known as 'Indian improved lands' is a rather pressing one in the district, but it seems to be impossible to do very much in disputes involving such lands until the lands are properly designated, vested in the Department of Indian Affairs, and provided with duly recorded water privileges.

"Dry-farming has proven to be very successful at several favoured spots in the districts; notably at the Hilborn Ranch, about nineteen miles south of Quesnel; Springhouse Mountain; the Mondada Dry Farm, now owned by C. E. Wynn-Johnson, near Alkali Lake; Big Bar; and at the Government Experimental Farm at the 105-Mile post on the Cariboo Road. However, even where the dry-farming methods are most successful, water would be a great advantage if it could be procured, and in most portions of the districts irrigation is absolutely essential to successful farming."

SPECIAL REPORTS.

Commission investigating Irrigation Companies.

J. S. T. Alexander, E. Davis, and F. H. Kidd, who were appointed as a Commission under the provisions of section 171 of the "Water Act," as amended in the "Water Act Amendment Act, 1917," submit the following report:—

"We visited the Okanagan Valley for the purpose of investigating the affairs of the Okanagan Securities Company, Limited, at Naramata; the Peachland Townsite Company, Limited, at Peachland; the Peachland Real Estate and Fruit Company, Limited, at Trepanier; and the Westbank Irrigation Company, Limited, at Westbank, with a view to reporting on their financial conditions, the general state of their water systems, and their ability to fulfil their obligations to water-users.

"Our authority for making such investigations were orders of the Lieutenant-Governor in Council passed under the provisions of section 171 of the 'Water Act, 1914,' as amended in 1917.

"The companies were investigated in the above order. The books, balance-sheets, contracts, and other documents were in all cases cheerfully produced by the officers of the several companies and every assistance afforded us in our examinations. Much evidence also was given orally both by officers and employees of the companies and by the water-users.

"Although the particulars differed in each case, the general situation of the four companies is more or less identical as far as their irrigation undertakings are concerned; as, for instance:—

"None of these companies is authorized under the 'Water Act' to carry water or to charge tolls for so doing.

"In all cases the water-supply is deficient owing to the creeks in this part of the country going almost or quite dry towards the latter part of the summer. Most of the evidence given touched upon this point. There is plenty of water in the spring, much more than can possibly be used, and the greater part of it runs away into Okanagan Lake. Then when the hot weather comes in July and August and water is urgently needed for irrigation, the creeks dry up to such an extent that there is seldom enough water to mature the crops properly, sometimes not enough to keep them alive. Reservoirs have been constructed in some places, but even now are not of sufficient capacity, and the shortage will be more keenly felt from year to year as more land is brought under cultivation and fruit-trees increase in size.

"The solution of the storage problem is vital to the success of the districts irrigated by these companies' systems, and the construction of storage-reservoirs of sufficient capacity to supply the necessary water when the creeks begin to go dry is imperative. The cost of such reservoirs will be considerable, and must eventually fall upon the water-user and add to his already heavy annual expenses.

"The actual carrying capacity of the water systems of these companies is generally sufficient to deliver the water required for the irrigation of the lands now under cultivation, although in some places ditches and flumes might be enlarged with advantage.

"When selling their lands the companies and the buyers entered into contracts under which the companies agreed to deliver a certain fixed quantity of water to the land bought. Though these contracts were evidently entered into in good faith by both sides, they were founded on ignorance or misconception of irrigation requirements. Experience now shows that the quantity of water and the times and conditions under which it is agreed to be delivered are insufficient and unsuitable for the proper irrigation of the lands.

"The annual tolls are based upon the acreage bought by the water-user and vary from $2.50 to $5 an acre. The rate most generally charged heretofore has been $3 an acre, and as the same is payable for each acre, whether irrigable or not, the cost of water for the land actually irrigated will average nearer $5 than $3. Taking one season with another, the average irrigator of a 10-acre fruit-farm does not seem to be able to make more than a bare living and pay the present rates under the existing conditions of water-supply.

"The revenue derived by the companies from these water rates is hardly sufficient to meet the expenses of operating the systems and making the repairs necessary to keep them in working-order. No money is available to form sinking funds out of which to renew the structures when they become unserviceable through decay, or to pay interest on the capital invested in the construction of the system.

"The companies having no source of revenue, as far as their irrigation undertakings are concerned, other than the water rates, these would have to be increased in order to produce enough money to meet the above charges.

"If the present water rates were raised to $5 for every acre below the companies' main ditches, whether irrigable or not, the consequent revenue would probably be enough to maintain and operate the works and provide the necessary annual addition to the sinking fund, but it would not pay interest on the capital originally invested in building the irrigation-works nor on the money which would have to be provided to form the nucleus of the sinking fund. Therefore the rate would have to be still further increased. However, as the land of the water-user cannot pay more than $5 an acre for the present inadequate service; the companies are in a decidedly uncomfortable position. On the other hand, the water-user is in one even more precarious. If the company chooses to enforce its water agreements to the letter, the water-user will receive about half of the insufficient supply he now gets, and if he seeks to increase this by the erection of storage-works he may be faced by the refusal of the company to carry the stored water for him altogether or else only at an exorbitant cost; and, worse than this,

he may be confronted by an injunction to restrain him storing or using such water, as he has covenanted with the company in his water agreement not to obtain or apply for water rights beyond those under which the company is working. In any event, if these calamities do not befall him, the cost of construction and maintenance of the storage-works will have to be added to his already heavy annual expenses.

"We found that the works in all the systems we examined are in a more or less dilapidated condition and a considerable amount of money will have to be spent before long in reconstruction.

"An irrigation system in nearly all its particulars begins to depreciate in value from the moment of its construction. Consequently, before using its revenue otherwise, an irrigation company ought to provide annually not only for current repairs, but for making good depreciation and replacing the parts of the works when they come to the end of their life. It is the manifest duty of such a company to make such a provision not only in the interests of its shareholders and mortgagees, but also in those of its customers, the water-users. Failing such a course, the only method of providing for the replacement of property which has ceased to be useful is by the investment of fresh capital raised either by the issue of further shares or by a new mortgage on its property.

"From the fact that no provision is made for perpetuating the irrigation-works, as they gradually rot out and disintegrate with the effluxion of time, we are forced to conclude that the companies are not dealing fairly with the water-users, who bought the land from them as 'irrigated land' and paid a high price for it in consequence.

"It is a question for serious consideration whether the companies under examination should be allowed to continue operations as irrigation companies. They were originally organized for the purpose of selling land and conveying water to that land in order to make it saleable. Now, having disposed of the greater part of the land, they still cling to the irrigation-works and operate the same under conditions which place the water-user absolutely at their mercy. This state of affairs is distinctly at variance with the principles upon which water legislation in this Province was founded. From the earliest times the Statutes affecting irrigation rights have declared the water to be an appurtenance of the land. It would seem, therefore, that it is contrary to the interest of the land that the works for conveying the water (which is part and parcel of it) to the land should be in the possession of a corporation seeking profit. The true principle seems to be that the irrigation systems should be owned by the people to whose lands they carry water, and should be maintained and operated by them through the agency of some form of co-operative association or mutual arrangement.

"As matters stand at present, all efforts by the people to obtain control of these irrigation systems have been frustrated by the companies placing prohibitive prices on the works.

"We venture to suggest that a Commission similar to the 'Public Utility Commissions' of other Provinces might be created to take over the affairs of the companies, and operate the systems until a general reorganization looking to the best interests of all parties concerned can be effected.

"As stated before, some form of co-operative control ought to own and operate the systems, and the suggested Commission should have the power to appraise the works and fix the price at which such co-operative associations could take them over. In making any such valuation, it might not be inequitable to consider that the water-user has already contributed towards the cost of the works when he has bought land at such figures as $200 an acre.

"Taking each company in the order in which we examined its affairs: It was found that the irrigation system of the Okanagan Securities Company had depreciated in value since its construction to the extent of some $13,700, and that the company had no assets which could be made immediately available for the purpose of making the works as good as new. Consequently new capital to that extent should be introduced and a sinking fund formed with it.

"In addition to this, the company will have to add to such sinking fund every year a sum which, with accumulated interest, will be sufficient to renew the whole of the perishable part of the system at the end of its effective life.

"The foregoing remarks on the Okanagan Securities Company apply also to the Peachland Townsite Company, with the exception that the depreciation of its system is estimated at $9,500 instead of $13,700.

"Among the suggestions we offer towards the solution of the problem in the cases of these two companies are the following:—

"That the companies deposit with the Government a sum of money equal to the estimated loss in physical value of their irrigation systems. Such sum to be used for the renewal of the depreciated structures.

"That they set aside out of revenue each year a sum sufficient to provide for the annual depreciation of the irrigation structures and deposit the same in the Provincial Treasury, to be held there as a form of sinking fund to secure to the water-users the renewal of such structures.

"That every year they file with the Comptroller a copy of their revenue accounts, balance-sheets, and auditor's report.

"That existing water agreements be replaced by new ones under which an adequate supply of water will be delivered and reasonable provisions made for the protection of both parties. No such agreement or any other agreement for the carriage or supply of water shall be entered into until it is submitted to and approved by the Department.

"Procure licences for the carriage of water under the provisions of the 'Water Act,' so that they may be in a position to enforce payment of water rates.

"The Peachland Real Estate and Fruit Company, Limited, at Trepanier, has practically abandoned all the irrigation-works it constructed. We have recommended that these works be declared to be part and parcel of the lands which they serve. This has been done by an Order in Council under the provisions of section 171 of the 'Water Act' in its amended form. The water-users can then form themselves into an association to maintain and operate the works as their own property.

"In the case of the Westbank Irrigation Company, Limited, a similar recommendation was made."

PROPOSED PUBLIC IRRIGATION CORPORATION AT VERNON.

E. Davis, M.Can.Soc.C.E., submits the following report on the proposed public irrigation corporation at Vernon:—

"Considerable time and study has been given by the Water Rights Branch to the irrigation problem around Vernon. The situation there may be considered as acute, as the water-supply to upwards of 8,000 acres of land now being irrigated is in more or less jeopardy owing to the irrigation systems supplying the land being in a more or less dilapidated state, and there being no funds available to make the necessary repairs and renewals.

"The territory under consideration is being served with water for irrigation by two companies—viz., the White Valley Irrigation & Power Company and the Coldstream Estates Company. The former gets its water-supply from Jones Creek, a tributary of the Shuswap River, and the latter company from Coldstream Creek and its tributaries.

"The White Valley Irrigation & Power Company was formed for the purpose of supplying water for irrigation to a large territory, and was to do so purely as a water company, making sufficient revenues out of its tolls, etc., for carrying on its business. The Coldstream Estate Company, on the other hand, carried on the water system as an adjunct to the disposal of its lands and also for supplying its own ranch with water.

"However, the point now being considered is some form of co-operative association whereby the control and operation of these water systems will be in the hands of the actual water-users. With that end in view, an attempt has been made to form a public irrigation corporation embracing all the lands being served with water from the two systems.

"Owing to the varied interests involved, progress has been slow, as it has been deemed advisable that all parties interested should discuss as much as possible the contentions of each; however, progress is being made in the signing of the petition. One of the chief matters on which every one appears to be very firm is that the report of the Board of Investigation should be very searching, and should set out clearly, as nearly as possible, the obligations of each water-user. This will involve considerable work, as it is very evident that before any reliable figures can be placed before the water-users there will have to be an agreement between the conflicting interests, preferably based on the findings of a judicial commission. On the results of these findings definite figures can be placed before the water-users.

"The investigations made up to the present have had an effect of suggesting a number of amendments to Part VII. of the 'Water Act'—viz., that portion dealing with public irrigation corporations.

"As stated before, the White Valley Irrigation & Power Company was incorporated for the purpose of supplying water to the owners of land who were desirous of obtaining water. During

the first years of operation a bonus of $20 per acre was required to be paid to the company, whereas of late years $50 per acre was demanded. In consideration of this the water-user was to get stock in the water company.

"The mode of operation of the company was that each year each water-user had to apply for the quantity of water he would require during the season, and the payment for same was to be based on actual measurement or on the estimated requirement. This has led to a very unstable revenue to the company, and although the works were constructed to supply a water-user, he need not necessarily use any water; consequently the money the company had put into these works was lying idle.

"As a very considerable portion of the distribution laterals are constructed of perishable materials and some have come to the end of their useful life, they need renewing. Owing to the small revenue from the water-users there has not been enough money above the operation expenses to provide an adequate depreciation reserve, let alone pay any interest on the capital invested; consequently the company is in difficulty, and it is very evident that as more structures deteriorate the position will be far worse.

"In the case of what is known as the Coldstream internal system, it would appear that eventually similar trouble will befall the system there. Apparently both the company and its predecessor and the water-users entered into agreements under certain terms and conditions which are hard to fulfil, and in order to obtain more satisfaction by both parties new agreements must be entered into.

"This state of affairs under both systems has led to consideration of control of both systems by the water-users. A number of suggestions have been made by this Department in order to show approximately the annual rentals the water-users will have to pay in the event of it being decided to take over the control from the companies. It has been suggested that one large corporation controlling the two systems would be preferable to two or more corporations operating and controlling different sections. As an alternative it is suggested that there should be one main parent corporation controlling the main works, and that the distribution of the water should be carried on by local communities. This is on the principle that the water-users at one end of the system will have very little in common with the water-users at the other end. Furthermore, it is claimed that under this arrangement each distribution group will be assessed according to the expenses of such group and will have to stand on its merits.

"However, whichever way these matters are decided upon, there remains certain fundamentals which have necessarily to be considered in arriving at the annual expenses. These are:—

"(1.) *Interest.*—In the case of money which will have to be raised for the purpose of either acquiring or constructing works, bonds will have to be issued, and for this money interest will be charged. The bonds, whether serial or otherwise, will probably mature in twenty or thirty years and will have to be redeemed in that time.

"(2.) *Sinking Fund for Redemption of Bonds.*—As the name implies, this fund is for the purpose of redeeming bonds. Should the bonds be in the form of serial bonds—that is, paying off interest and principal yearly—this would provide the cheaper way of borrowing; otherwise a special sinking fund placed in the Provincial Treasury at 3 per cent. interest per annum will have to be provided.

"(3.) *Depreciation.*—Depreciation may be divided into three or more well-defined classes: (*a*) Ordinary wear and tear resulting in small breaks, which are repaired from day to day, constituting ordinary maintenance; (*b*) the deterioration which takes place in a machine or structure in such a way as not to appear as a necessary immediate repair, but which ultimately results in the entire machine or structure being replaced as a whole after a more or less extended period of service; (*c*) unusual or accidental damages resulting from extraordinary conditions, as floods, fires, etc. The first should be taken care of in the current maintenance expenses and need not be provided for in any depreciation estimate, as the expense of repairing the damage is usually coincident with the damage. The second and third divisions are those which in commercial undertakings are usually provided for by setting aside a definite monthly or annual allowance for depreciation. This is sometimes computed on a product basis, but there is no way of arriving at a mathematically accurate amount to set aside to provide for such losses. The best that can be done is to set aside in reserve a sum to create a fund to draw upon when such losses occur. This should be done having in view the constant and extraordinary deterioration noted above.

"Referring to the last sentence of the extract, it is proposed to arrive at a sum to be annually set aside by estimating the life of the various works which compose the system. This estimate could be revised, say, every five years, and the sum adjusted to meet any extraordinary deterioration which appears to be going on. It is apparent to every one that this is a very important fund, especially where, in British Columbia, the life of the structures is not long, and they will have to be replaced every ten to fifty years, according to their nature and construction; it would be very unwise to wait until a large structure costing $30,000 or $50,000 had to be replaced and then charging the whole to the water-users in a few annual payments; besides, it would mean more selling of bonds or borrowing money.

"(4.) *Repairs.*—This item would vary from year to year, as the works, no matter how substantially constructed, will need some attention annually.

"(5.) *Management and Operation.*—Under this item would come all office expenses and wages paid to water bailiffs, ditch-riders, etc.

"(6.) *Delinquencies.*—Under practically all irrigation systems there will be found cases where all the moneys due cannot be collected, and it has been found under the irrigation district laws of California that provision must be made for these bad debts.

"The annual rentals which appear will have to be paid by the water-users will probably be between $4 and $8 per acre. It is the opinion of a number of water-users that the annual rentals should not exceed $3 per acre for ordinary farm land and $5 per acre for orchards. From a study of the annual expenses of the various systems, it is evident that such a charge would not provide much revenue in excess of that required for management and operation, repairs and depreciation; consequently, if the water-users are called upon to pay an annual rental greater than those figures, they must consider same in the form of a capital charge against their land, which charge they are paying off in annual instalments for a term of years, depending on the life of the bonds issued.

"Whoever operates the systems in future, whether the present companies or the water-users, must be prepared to expend a certain amount of new capital. If the water-users purchase the systems, then they must be prepared to increase the capital cost of their lands to the extent of such purchase, also they must be prepared to further increase this capital cost of their lands to the extent of the reconstruction expenses, which expenses should have been provided for out of the revenues of the past years of operation of the company. On the other hand, if the companies continue the operation of the systems, they must be prepared to sink new capital for the reconstruction of the systems for the fulfilment of their contracts. Should the contracts be insufficient to provide the revenue required to pay interest on the reconstruction, provide for depreciation and the management and operation expenses, then it is only a matter of time before they are in further difficulty.

"Whichever way one looks at the present conditions, it is evident that the difficulties are great for a conclusion satisfactory to all. As suggested above, it would appear advisable that a qualified Commission act as arbitrators on the matters involved, and that both parties agree to the findings of that Commission."

DATUM-PLANES.

The establishing of definite figures correlating the various datums in use on the Lower Mainland has made further progress, and we are indebted to A. J. Dalzell, of the City Engineer's Office, Vancouver, for the final figures relating to this important subject. The table given herewith has been submitted to Dr. Dawson at Ottawa for confirmation and may now be taken as correct:—

British Columbia Mainland Datum-planes.

Datum-planes referred to Vancouver Harbour Tide-levels.	O.L.W.		M.S.L.		H.W.L.	
	Plus Feet.	Minus Feet.	Plus Feet.	Minus Feet.	Plus Feet.	Minus Feet.
Admiralty datum (O.L.W.)	Zero.	Zero.	..	8.03	..	13.00
Mean sea-level (M.S.L.)	8.03	..	Zero.	Zero.	..	4.97
High-water level (average of higher high water)	13.00	..	4.97	..	Zero.	Zero.
Datum of Canadian Pacific Railway Co.	..	84.77	..	92.80	..	97.77
Datum, City of Vancouver	..	83.52	..	91.55	..	96.52
Datum, City of New Westminster	16.75	..	8.72	..	3.75	..
Datum, Provincial Water Dept., Fraser River	..	0.70	..	8.73	..	13.70

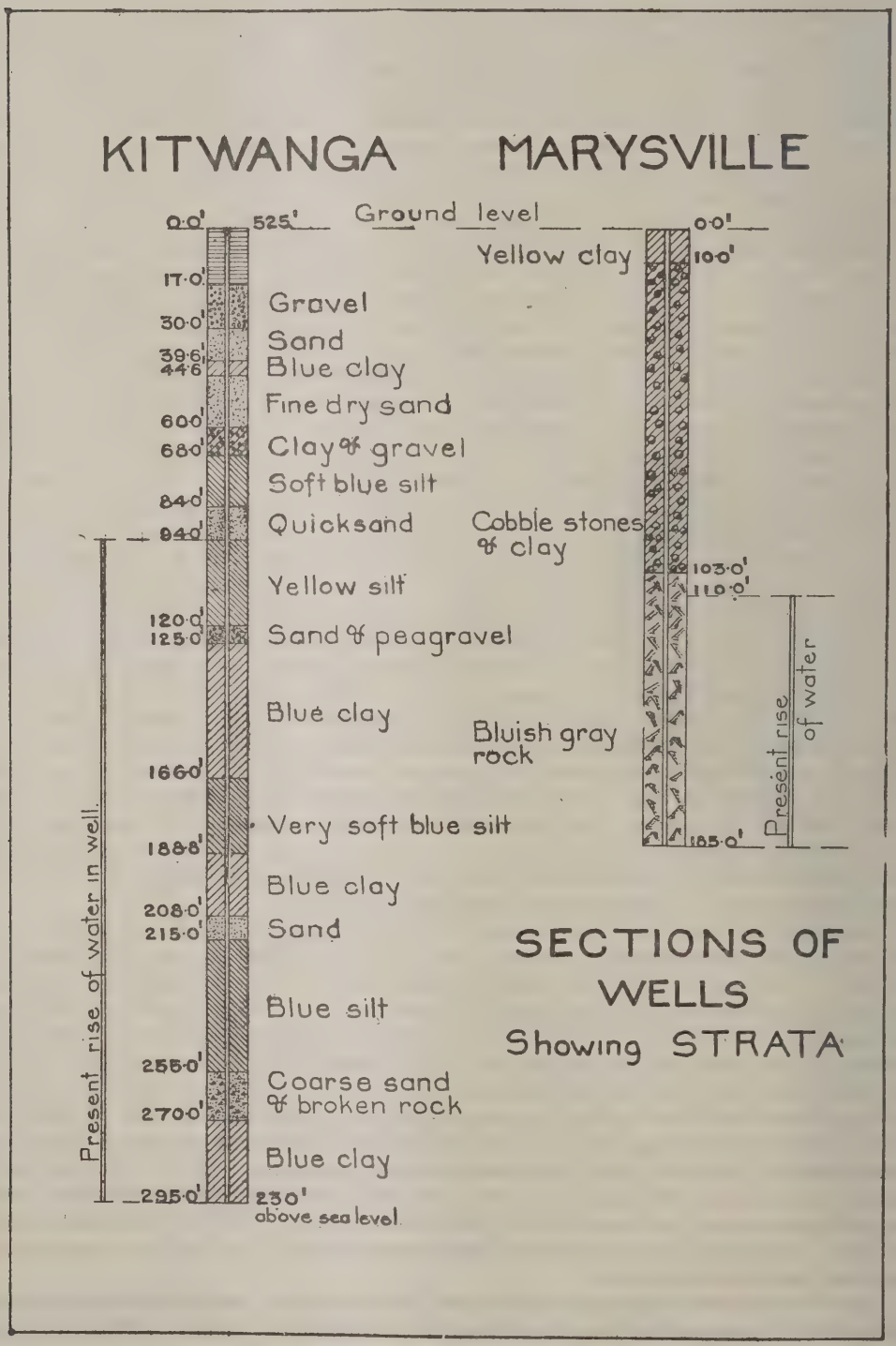
Well-drilling.

Well-drilling has been carried on at two places in the Province during the last year—in the Hazelton Water District near Kitwanga, on the Grand Trunk Pacific Railway, about twenty-five miles west of Hazelton, and at Marysville, in the Cranbrook Water District. Operations were commenced rather late in the season, it being August before drilling was commenced in the north, and September before the well-drilling superintendent and outfit were on the ground in the Kootenays. Adding to this the difficulties that were encountered owing to the class of material met with, and which are more fully described in the details of the wells, the results have not been up to expectations.

Kitwanga-Prince Rupert District.—This well has been sunk on the first bench on the north side of the Skeena River at an elevation of 104 feet above the river and 525 feet above sea-level. Owing to the fact that the Grand Trunk Pacific Railway cutting shows about 40 feet of gravel and boulders, a 3-foot 6-inch diameter shaft was sunk for 17 feet before commencing to bore, the gravel continuing to a depth of 30 feet and being followed by 9½ feet of sand. The first real trouble was met with here in the form of a large boulder, and it was with difficulty drilled through and broken to allow the 6-inch pipe to pass through. Blue clay to a depth of 4 feet was found underlying this stratum; then followed a very fine dry sand, through which driving the pipe ahead of the drilling was resorted to, as it was not possible to keep the sand wet enough to get it out with the sand-pump. After driving 16½ feet blue clay mixed with coarse sand was encountered, which gave easy drilling; from being hard at the top it gradually softened to a blue slime until, at a depth of 84 feet from ground-level, water burst in, accompanied by a very fine sand, the two producing a quicksand which caused trouble to the full depth the pipe was sunk. A silt was next struck, which lasted for 26 feet, and was of such a soft nature that it mixed with the sand and water, rising to 94 feet from the surface. After a 5-foot stratum of pea gravel, 41 feet of hard blue clay was pierced, which then softened to the blue slime already met with previously, and gradually hardened again to blue clay, which lasted to the 208-foot mark. After a 7-foot seam of sand a further 40 feet of blue clay was encountered, till coarse sand was entered containing an abundance of water, which rose to 161 feet in the bore, and maintained its level in spite of efforts to lower it. Pieces of broken rock similar to that in the small slides seen in the district were brought up in the pump, and these with the softness of the formation caused the pipe to run out of plumb to such an extent that for a time the tools would not work to the bottom. After considerable difficulty the pipe was straightened and driven into a hard blue clay to a depth of 288 feet from ground-level, beyond which it cannot be moved. Drilling was continued for another 7 feet, when operations for the season were closed down. It is suggested that at the resumption of the work a 5-inch pipe should be sunk within the 6-inch, and the upper 270 feet withdrawn when water is reached.

Marysville-East Kootenay.—In September a portable gasolene well-drilling machine was shipped into the East Kootenay portion of this district. The farmers living on portions of St. Mary's Prarie have been hauling water for years, and it was therefore considered that they had the first call on the drill. Accordingly, on September 15th, drilling operations were commenced on Mr. Bennett's farm, near Marysville. Trouble was experienced in striking large boulders at the side of the hole, which made it very difficult to drill a straight hole. For the first 103 feet the drill went through clay, boulders and gravel, stones and clay. At the above depth rock was struck and continued to the 170-foot level, where a good supply of water was found. After cutting through the rock to water, the well superintendent deemed it advisable to drill another 15 feet to form a receiving or gathering chamber for the water and also to prevent any "cave-in" that might take place. The well-casing was discontinued at the upper side of the bed-rock or the 103-foot level. The boulder difficulty was finally overcome by using dynamite. The water rises in the well by static pressure to within 110 feet of the surface, and has a fair yield for domestic use.

On November 12th the drill was moved to Mr. Glanville's farm, and drilling was commenced on the 14th. The operations were closed down for the season on December 20th on account of severe weather. The depth drilled in this well is 92 feet and will be completed in the spring.


KITWANGA
MARYSVILLE
0·0'
525'
Ground level
17·0'
30·0'
39·6'
44·6'
60·0'
68·0'
84·0'
94·0'
120·0'
125·0'
166·0'
188·8'
208·0'
215·0'
255·0'
270·0'
295·0'
Gravel
Sand
Blue clay
Fine dry sand
Clay & gravel
Soft blue silt
Quicksand
Yellow silt
Sand & peagravel
Blue clay
Very soft blue silt
Blue clay
Sand
Blue silt
Coarse sand & broken rock
Blue clay
230'
above sea level
Present rise of water in well.
0·0'
Yellow clay
100'
Cobble stones & clay
103·0'
110·0'
Bluish gray rock
185·0'
Present rise of water
SECTIONS OF WELLS
Showing STRATA

METEOROLOGICAL REPORT, 1916-17.

Work during the year has been continued along the lines formerly adopted. The total number of stations maintained during the year was 173.

Owing to the great reduction in the staff it has again been impossible to carry out analytical work.

That the benefit expected to result from the co-operation which, as mentioned in last year's report, had been established between the Dominion Meteorological Service and this Department has been fully realized is shown by the following table, compiled from the records of the Dominion and Provincial Stations.

Complete records have been received for the past year from 169 stations. Of these, 133 show decreases and seventeen show increases, compared with the records for same stations in 1915-16. Further, 145 stations show decreases and fourteen show increases, compared with average records for same stations in 1915-16.

At Coquitlam Lake and Quatsino, each with twelve years' records, lowest records which were established in 1914-15—considered a dry year and in which a number of lowest records were established—were again lowered last year from 111.47 to 78.39 to 110.48 and 74.86 respectively.

The table herewith is compiled from all sources of available information and for all stations, whether maintained at the present time or not. In making use of this table for average precipitation, reserve should be placed on the figures for a period of less than ten years.

PRECIPITATION, 1916-17.

Station.	No. of Years of Complete Observation.	Average Precipitation.	Precipitation of Year.	Percentage above Average.	Percentage below Average.
		Inches.	Inches.	Inches.	Inches.
Abbotsford	15	60.82	...	...	...
Agassiz	28	62.93	58.42	...	7.2
Ayansh	3	32.36	41.42	...	...
Alberni (Somass River)	20	71.70	...	...	...
Alberni (Beaver Creek)	21	67.78	47.04	...	30.6
Alert Bay (Mission)	1	40.05	...	...	...
Alert Bay (Wireless Station)	2	40.84	40.24	...	...
Alkali Lake	5	10.57	7.89	...	...
Alouette	6	98.95	98.15	...	...
Alvaston	2	10.75	8.24	...	...
Anyox (Granby Bay)	1	...	78.20	...	...
Armstrong	5	18.73	14.68	...	...
Ashcroft	3	8.21	6.56	...	...
Aspen Grove	4	14.91	11.50	...	...
Atlin	12	10.48	7.52	...	28.2
Babine Lake	2	20.82	...	...	...
Bamfield	2	84.83	...	...	...
Barkerville	28	35.09	43.92	25.2	...
Baynes Creek	1	...	12.59	...	...
Bear Creek (Jordan River)	6	98.23	90.07	...	...
Beaver Lake, V.I.	22	35.12	30.19	...	14.0
Bella Coola	16	42.82	41.95	...	2.0
Bevan, V.I.	3	61.94	36.48	...	...
Birchbank	4	25.83	21.88	...	...
Bonnington Falls	4	24.72	19.74	...	...
Boswell	2	27.42	...	...	...
Bridge River	4	18.83	21.66	...	...
Britannia Beach	3	69.91	56.92	...	...
Britannia Mines (Tunnel Camp)	2	98.06	...	...	...
Briscoe	4	17.22	13.59	...	...
Bullion (Quesnel Forks)	9	23.33	...	...	...
Buntzen Lake	14	108.67	90.75	...	16.4

PRECIPITATION, 1916-17—*Continued.*

Station.	No. of Years of Complete Observation.	Average Precipitation.	Precipitation of Year.	Percentage above Average.	Percentage below Average.
		Inches.	Inches.	Inches.	Inches.
Bute Inlet	3	61.22	53.66	...	...
Cache Creek	[illegible]	7.91	...	...	...
Cameron Lake	[illegible]	57.97	47.85	...	...
Canal Flats	3	18.40	10.79	...	...
Canoe Point (Shuswap Lake)	7	23.08	21.67	...	...
Cape Scott	9	113.79	...	...	...
Capilano Intake	3	110.77	94.57	...	...
Carcross (Yukon)	8	8.77	5.65	...	...
Carmanah	9	111.18	...	...	...
Carmi	4	18.24	11.84	...	...
Chilcotin (Big Creek)	13	12.97	8.23	...	36.5
Chilliwack	20	60.20	53.09	...	11.8
Chinook Cove	4	15.54	14.50	...	...
Christina Lake	4	22.35	17.07	...	...
Clayoquot	17	121.73	102.44	...	15.8
Clo-oose	2	78.89	...	...	...
Cobble Hill (Boatswain Bank)	4	35.74	32.33	...	...
Coldspring Ranch (Quilchena)	4	11.82	8.46	...	...
Coquitlam	16	71.06	67.38	...	5.2
Coquitlam Lake	14	147.37	110.48	...	19.6
Cowichan Bay	3	34.56	31.87	...	...
Cowichan Lake	4	78.45	57.64	...	...
Cranberry Lake	2	16.62	13.27	...	...
Cranbrook	9	16.33	11.49	...	...
Cranbrook (City)	4	15.92	11.74	...	...
Crawford Bay	6	30.57	30.07	...	...
Creston	5	20.17	15.79	...	...
Crowsnest	3	16.58	...	...	...
Cumberland	2	57.67	...	...	...
Dawson	4	10.64	12.40	...	...
Deer Park (Lower Arrow Lake)	3	16.18	14.88	...	...
Denman Island	9	50.26	35.73	...	...
Donald	3	23.51	...	...	...
Douglas Lake	3	12.47	...	...	...
Duncan	22	39.42	33.93	...	13.9
East Arrow Park	3	29.66	27.26	...	...
Echo Lake (Telegraph Trail)	3	23.18	21.24	...	...
Edgewater	2	14.83	...	...	...
Edith Lake	2	14.59	...	...	...
Elko	8	21.56	...	...	...
Elko (Town)	4	21.25	14.95	...	...
Enderby	13	20.99	19.19	...	8.5
Entrance Harbour	2	31.25	30.18	...	...
Estevan Point (Wireless)	1	90.31	...	...	...
Fairview	2	5.40	...	...	...
Fauquier	4	24.78	...	...	...
Ferguson	9	47.89	40.80	...	...
Fernie	3	42.03	41.91	...	...
Fernie (Dominion)	2	38.34	32.09	...	...
Fifth Cabin (Telegraph Trail)	3	34.29	31.29	...	...
Fort Steele	3	17.74	12.75	...	...
French Creek	10	36.53	...	...	...
Gillies Bay (Texada Island)	2	40.72	...	...	...
Glacier	11	62.60	64.63	3.2	...
Glenemma	3	24.95	29.94	...	...
Goat River Lodge (Powell River)	3	68.15	55.25	...	...
Golden	7	18.91	...	...	...

PRECIPITATION, 1916-17—*Continued.*

Station.	No. of Years of Complete Observation.	Average Precipitation.	Precipitation of Year.	Percentage above Average.	Percentage below Average.
		Inches.	Inches.	Inches.	Inches.
Golstream Lake, V.I.	21	63.87	52.39	...	17.9
Gooseneck Camp (Campbell River)	1	50.44	...	...	...
Grand Forks	8	16.55	16.26	...	...
Grand Forks (City)	4	16.84	14.16	...	...
Grande Prairie	1	13.35	...	...	...
Greenwood	5	19.91	24.87	...	...
Griffin Lake	3	42.01	...	...	...
Harpers Camp	3	19.52	26.07	...	...
Hartley Bay	1	84.75	...	...	...
Hatzic	1	82.23	...	...	...
Hazelmere	6	52.96	...	...	...
Hazelton	3	18.46	17.03	...	...
Hedley	13	11.79	11.14	...	5.5
Hedley (Nickel Plate Mine)	12	24.33	21.27	...	12.5
Holberg	7	126.66	98.87	...	...
Holt Creek (near Duncan)	1	39.18	...	...	...
Hope	9	52.25	42.56	...	...
Hornby Island	7	44.34	34.41	...	...
Ikeda Head	3	115.13	96.84	...	...
Invermere	3	12.43	9.20	...	...
Invermere (Experimental Farm)	4	12.61	8.42	...	...
Invermere (Comfort Ranch)	4	12.48	9.11	...	...
Ioco (Deer Lake)	1	...	73.15	...	...
James Island	3	23.71	20.56	...	...
Jones Lake	7	83.95	79.14	...	...
Jordan River, V.I.	9	67.13	63.38	...	...
Kamloops	24	10.31	9.79	...	5.0
Kaslo	6	22.88	20.06	...	...
Kelowna (Town)	18	12.41	7.90	...	36.3
Kelowna (Bankhead)	1	...	8.73	...	...
Kelowna (Rutland)	5	12.58	...	...	...
Kelowna (Hydraulic Summit)	5	21.79	20.05	...	...
Keremeos (Centre)	4	10.33	7.46	...	...
Keremeos (Town)	4	8.98	...	...	...
Kingcome	1	...	75.48	...	...
Kingsgate	3	26.86	21.72	...	...
Kitimat	3	82.50	...	...	...
Klinaklini	2	14.66	...	...	...
Knouff Lake	2	16.70	17.55	...	...
Kootenay Lake (Reclamation Farm)	7	23.11	...	...	...
Kuper Island	9	42.94	...	...	...
Ladner	17	34.98	27.85	...	2.0
Ladysmith	4	51.33	42.67	...	...
Langley	13	54.17	...	...	...
Lazo (Wireless Station)	3	43.63	36.63	...	...
Lazy "L" Ranch	2	17.51	...	...	...
Lillooet	6	13.88	...	...	...
Little Qualicum	7	37.32	26.67	...	...
Lumby	2	17.08	...	...	...
Lynch Creek	4	21.35	19.57	...	...
Lynn Creek	4	95.07	105.49	...	...
Malakwa	3	29.03	24.76	...	...
Mamete Lake	3	12.85	10.70	...	...
Mary Island	3	47.94	43.70	...	...
Masset	17	51.95	52.32	0.7	...
Metchosin	1	44.02	...	...	...
McCoy Lake	1	86.49	...	...	...

PRECIPITATION, 1916-17—*Continued.*

Station.	No. of Years of Complete Observation.	Average Precipitation.	Precipitation of Year.	Percentage above Average.	Percentage below Average.
		Inches.	Inches.	Inches.	Inches.
McClure Lake	3	15.90	10.16	...	...
Midway	7	12.67	...	...	...
Mill Bay (Nass)	4	76.54	75.54	...	...
Moha (Bridge River)	4	13.59	10.86	...	...
Monte Creek (Ducks)	8	9.94	7.41	...	...
Nakusp	5	27.46	23.21	...	...
Nanaimo (Bray's)	12	44.90	...	...	...
Nanaimo	15	39.09	29.49	...	24.5
Nanaimo (Biological Station)	4	36.16	29.49	...	...
Nanoose Bay	5	31.71	25.34	...	...
Naramata	2	11.11	...	...	...
Nass Harbour	17	77.40	64.59	...	16.6
Nelson	14	26.60	23.54	...	11.5
New Denver	3	30.88	29.54	...	...
Newgate (Yakite Ranch)	3	17.50	...	...	...
New Westminster	26	57.44	55.25	...	3.8
Nicola (Clapperton Creek)	4	15.52	13.70	...	...
Nicola Lake	37	11.07	6.92	...	37.5
Ninth Cabin (Telegraph Trail)	2	24.50	23.55	...	...
Nitinat Lake	3	121.08	95.96	...	...
North Bend	2	34.72	23.73	...	...
North Nicomen	23	74.39	62.47	...	16.2
Observation Bay	2	74.99	71.91	...	...
Ocean Falls	3	157.38	145.93	...	...
105-Mile House	4	12.08	10.84	...	...
Parksville	2	32.97	25.74	...	...
Pavilion	1	10.77	...	...	...
Peachland (Trepanier Creek)	3	15.74	11.04	...	...
Pemberton Meadows	5	34.03	20.72	...	...
Pemberton Hatchery	8	30.85	22.14	...	...
Penticton	10	11.51	8.56	...	...
Perry Siding	4	25.40	21.35	...	...
Phoenix	4	28.53	24.77	...	...
Pilot Bay (Kootenay Lake)	2	39.73	...	...	...
Point Grey	1	...	44.85	...	...
Porcher Island	1	81.06	...	...	...
Port Essington	4	122.86	...	...	...
Port Moody	6	66.83	...	...	...
Port Simpson	19	89.30	...	...	...
Powell Lake (upper end)	3	93.06	75.15	...	...
Powell River	3	38.81	33.38	...	...
Prince George	3	18.84	13.04	...	...
Prince Rupert	8	107.02	87.82	...	...
Princeton	19	13.14	9.28	...	29.3
Princeton Crossing	2	24.58	...	...	...
Qualicum Beach	1	....	27.23	...	...
Quatsino	14	107.64	74.86	...	30.4
Queen Charlotte City (Graham Island)	3	57.00	57.40	...	...
Quesnel	17	15.25	17.52	14.9	...
Quilchena (Dry Farm), Nicola P.O.	4	13.21	8.49	...	...
Revelstoke	16	41.26	34.87	...	15.4
Richlands (near Lumby)	2	21.30	...	...	...
Rivers Inlet	12	112.81	...	...	...
Rock Creek	5	15.35	13.64	...	...
Rossland	11	29.69	...	...	...
Salmon Arm (Hobson)	11	18.96	...	...	...
Salmon Arm (Sharp)	6	18.81	18.77	...	...

PRECIPITATION, 1916-17—*Concluded.*

Station.	No. of Years of Complete Observation.	Average Precipitation.	Precipitation of Year.	Percentage above Average.	Percentage below Average.
		Inches.	Inches.	Inches.	Inches.
Saltspring Island	7	39.25	36.38	...	...
Sandwick	3	51.58	39.93	...	...
Seymour Intake	4	105.32	88.80	...	...
Shawnigan Lake	6	40.48	34.40	...	...
Soda Creek	2	12.18	...	...	...
Sooke Harbour	5	42.67	33.31	...	...
Sooke Lake	5	66.00	...	...	...
Sorrento	3	17.89	...	...	...
Spences Bridge	11	9.44	...	...	...
Sproat Lake	1	47.32	...	...	...
Stave River Falls (Ruskin)	8	77.59	78.61	...	...
Steveston	21	37.73	32.23	...	...
Stewart	4	71.89	93.72	...	...
Stuart Lake	23	16.08	14.91	...	7.3
Summerland	10	11.24	8.49	...	24.5
Surf Inlet	1	...	153.14	...	...
Swanson Bay	5	183.91	...	...	...
Swift River (Cariboo)	1	22.93	...	...	...
Sidney (Experimental Farm)	3	30.57	29.38	...	...
Tappen	4	21.60	20.37	...	...
Terrace	3	38.24	35.64	...	...
Tete Jaune Cache	2	14.42	...	...	...
Thetis Island	2	36.57	...	...	...
Thrums	4	27.63	24.57	...	...
Tobacco Plains	6	17.21	...	...	...
Tranquille	5	9.32	6.59	...	...
Triangle Island	6	64.84	63.04	...	...
Ucluelet	3	109.95	90.21	...	...
Valdes Island	2	58.83	...	...	...
Vancouver	15	58.52	55.05	...	5.9
Vancouver (City Hall)	4	56.64	58.77	...	...
Vancouver (Court-house)	1	...	55.62	...	...
Vanderhoof	1	...	16.58	...	...
Vavenby	4	14.20	13.91	...	...
Vernon (Coldstream Ranch)	17	14.08	12.13	...	13.9
Victoria	43	29.26	23.20	...	20.7
Waneta	4	29.21	27.37	...	...
Westley	2	25.44	27.64	...	...
Wilmer	7	13.44	11.57	...	...
Wycliffe	1	8.96	...	...	...

I have the honour to be,
Sir,
Your obedient servant,

WILLIAM YOUNG, B.Sc., M.CAN.SOC.C.E.

APPENDICES TO WATER REPORT.

APPENDIX No. 1.

WATER-POWERS OF BRITISH COLUMBIA.

In preparing the list a careful analysis was made of all water records, licences, engineers' and surveyors' reports, and 457 sites were indexed. In many instances, however, the information available was scanty and insufficient to check the amount of power given. In the list, wherever the figures are uncertain, note is made under the "Remarks" column.

The 270 power-sites given are divided under the following heads:—

Wholly or partially developed	30
Sites applied for	93
Sites known and unstaked	147

With regard to those power-sites located by the Commission of Conservation, the figures must for the present be taken with reserve. A. V. White, of the Commission, intimates that it is unnecessary to emphasize the paucity of the hydrographic information existent for the northerly part of the Province. With respect to the estimates given, while these were based on such data as were available, it is clear that without explanation the quantities mentioned might be misleading. When the report on the "Water-powers of British Columbia" is published, in connection with the tabular material relating to horse-power, there will be explanatory notes and comments, also description governing the use of the tables.

WATER-POWERS OF 500 HORSE-POWER AND OVER.

No.	Creek.	Tributary of.	H.P.	Applicant or Licensee.	Remarks.	Source of Information.
	ALBERNI WATER DISTRICT—					
1*	Ash River	Stamp and Somas Rivers	11,500	....	....	Water Rights Branch, 1913 Report, p. 40.
2†	Beaver Creek	„ „	3,000	Alberni Hydro-Elec. Power Co.	....	Application.
	DRINKWATER RIVER—	GREAT CENTRAL LAKE.				
3†	Della Falls	 875		Big Interior Gold Mines, Ltd.		
4*	Rapids below Lower Canyon	 4,300		....		
5*	Lower Canyon	 3,325		....		
6*	Between Lower and Upper Canyon	 1,880		....		
7*	Between Upper Canyon and Bridge	 2,400		....		
8*	Drinkwater Falls	 1,050		....		
			13,830	....	....	1913 Report, p. 40.
10*	Great Central Lake	Stamp and Somas Rivers	21,900	....	Alternative to development on Upper Stamp River	„ p. 40.
11*	McBride Creek	Great Central Lake	800	....	....	„ p. 40.
12†	Nahmint River	Alberni Canal	2,400	Central Island Power Co., Ltd.	....	„ p. 41.
14†	Sarita River	Barkley Sound	3,350	British Pacific Hydro-Elec. & Tramways, Ltd.	....	Application.
15†	Sproat River	Somas River	6,400	Vancouver Island Elec. Railways Co., Ltd.	....	1913 Report, p. 40.
16*	„	„	7,600	....	Additional to normal power and dependent on Great Central Lake Development (*see* No. 10)	„ p. 41.
17†	Stamp River	„	19,000	Ritchie-Agnew Power Co., Ltd.	....	1913 Report, p. 40, and company's data.
18*	Upper Stamp River	„	3,800	....	....	1913 Report, p. 40.
19*	View Lakes	Great Central Lake	1,200	....	....	„ p. 40.
20†	Gold River	Muchalat Arm	4,000	G. J. Cox	....	Application.
	ASHCROFT WATER DISTRICT—					
1†	Anderson River	Fraser River	8,500	Imperial Power Co.	....	Application.
3*	Coquihalla River	„	8,400	....	....	1913 Report, p. 44.
4†	Emory Creek	„	3,000	Imperial Power Co.	....	Application.
7†	Nahatlatch River	„	30,000	„	....	B.C. Hydrographic Survey Report, 1913, p. 239.
8†	Nicolum River	Coquihalla River	10,000	McKenzie & Mann	Included in figures given for joint scheme (*see* No. 14).	
10†	Silver River	Fraser River	11,500	Silver River Power Co.	....	Application and B.C. Hydrographic Survey Report, 1913, p. 127.
11†	Siwash Creek	„	4,000	Imperial Power Co.	....	Application.
12†	Skuzzy Creek	„	5,600	„	....	„
13†	Spuzzum Creek	„	10,000	„	....	„
14†	Sumallow River	Skagit River	35,000	McKenzie & Mann	Joint scheme with Nicolum River (*see* No. 8)	Data submitted by company.
15†	Texas Creek	Fraser River	3,000	Imperial Power Co.	....	Application.
16†	Yale Creek	„	3,600	„	....	„
	BARKERVILLE DISTRICT—					
18†	Swift River	Cottonwood River	10,000	Quesnel Hydr. Gold Mining Co.	Plant installed, not now in operation.	

	Fernie Water District—					
2†	Bull River	Kootenay River	6,500	Bull River Elec. Power Co.	....	Water Rights Branch, 1912 Report, p. 95.
3†	Elk River	„	11,600	Crow's Nest Pass Electric Light & Power Co.	....	do. p. 99.
5*	Phillips Creek	„	750	....	....	1913, Report, p. 74.
6†	Wild Horse Creek	„	850	D. F. Basden	....	Engineer's Report.
	Fort Fraser Water District—					
1†	Stellaquo River	Fraser Lake	6,000	Fraser Lake Water & Power C	....	Application.
2*	Stony Creek	Nechako River	1,600	....	....	„
	Fort George Water District—					
1*	Beaver River	South Fork, Fraser River	900	....	....	Surveyor's estimate.
2*	Boulder Creek	Canoe River	...	....	Over 1,000 horse-power per mile	1912 Report, p. 32.
3*	Cottonwood River	South Fork, Fraser River	700	....	....	Surveyor's estimate.
4*	Fraser River	....	5,600	....	At Lower Falls	*See* No. 8.
5*	„	....	5,600	....	At Upper Falls	„
6*	Harvey Creek	Canoe River	...	....	Over 2,000 horse-power per mile	1912 Report, p. 32.
7†	Hixon Creek	Government Creek	850	E. Bloomfield	....	Application.
8†	Moose River	Fraser River	24,000	Yellowhead Pass Light & Power Co.	....	Data submitted by company
9*	Raushuswap River	South Fork, Fraser River	2,000	....	....	Surveyor's estimate.
11†	Willow River	Fraser River	3,500	Fort George Power Co.	....	From low-water flow.
	Golden Water District—					
1*	Blaeberry River	Columbia River	2,000	....	....	Data uncertain.
2*	Columbia River	....	...	....	Power-site at Surprise Rapids, horse-power unknown.	
3†	„	....	5,700	Canadian Pacific Rly.	....	Data submitted by company.
4*	Cummins Creek	Columbia River	3,800	....	....	1912 Report, p. 31.
5*	Spillimacheen River	„	3,850	....	....	1913 Report, p. 77.
6*	Wood River	„	5,000	....	....	1912 Report, p. 32.
	Grand Forks Water Dist.—					
3‡	Kettle River	Columbia River	5,000	West Kootenay Light & Power Co.	Site at Cascade; developed.	
4‡	North Fork, Kettle River	„	700	Granby Mining, Smelting & Power Co.	Developed.	
	Hazelton Water District—					
2§	Boulder Creek	Bulkley River	1,000	Grand Trunk B.C. Coal Co., Ltd.		
3§	Bulkley River	Skeena River	40,000	....	At Hagwilget Canyon.	
3A§	„	„	27,000	....	At Moricetown Falls.	
4§	Copper River	„	7,500	....		
6§	Mud Creek	Bulkley River	500	....		
7§	Skeena River	....	30,000	....	Kitsalas Canyon; proximity of railroad may interfere with development.	
8§	Bulkley River	Skeena River	20,000	....	At Beaumont Canyon.	
9§	„	„	25,000	....	Canyon 37 miles above Hazelton.	
10§	„	„	6,300	....	At Telkwa; proximity of railroad may interfere with development.	
12§	Canyon Creek	„	1,500	....		
14§	Driftwood Creek	„	750	....		
15§	„	Bulkley River	500	....		
18§	Gold River	Skeena River	600	....		
24§	Morice River	Bulkley River	8,000	....		
27§	Porphory Creek	„	500	....		
28§	Skeena River	....	20,000	....	Canyon just north of Hazelton.	

* Powers available. † Powers staked. ‡ Powers developed and under development. § Powers available, investigated by Conservation Commission of Canada.

WATER-POWERS OF 500 HORSE-POWER AND OVER—*Continued.*

No.	Creek.	Tributary of.	H.P.	Applicant or Licensee.	Remarks.	Source of Information.
	HAZELTON WATER DISTRICT—*Concluded.*					
29§	Skeena River	....	15,000	....	20 miles above Babine River.	
30§	"	....	10,000	....	Canyon near 3rd Telegraph Cabin.	
31§	"	....	14,000	....	Canyon 9 miles above 4th Telegraph Cabin.	
32§	Telkwa River	Bulkley River	700	....		
33§	"	"	1,000	....	Canyon near Pine Creek.	
36§	Big Slide Creek	Skeena River	1,300	....	Near 3rd Telegraph Cabin.	
	KAMLOOPS WATER DISTRICT—					
1†	Adams River	Shuswap Lake	6,500	B.C. Hydraulic Power Co.	....	Application.
2‡	Barriere River	North Thompson River	20,000	Kamloops Hydro-Elec. Co.	2,200 horse-power developed.	
6*	Canim Lake	Clearwater River	...	....	Horse-power unknown, but must be considerable.	
7†	Clearwater River	North Thompson River	2,000	Imperial Power Co.	....	Application.
14*	Myrtle River	Clearwater River	...	....	Helmcken and Dawson Falls.	
16*	Seymour River	Shuswap Lake	600	....	....	Data uncertain.
	KASLO WATER DISTRICT—					
2†	Cedar Creek	Kootenay Lake	1,700	Consolidated Mining & Smelting Co.	....	Application.
3‡	Coffee Creek	"	590	Kootenay Air Supply Co.	Developed.	
5†	Kaslo Creek (South Fork)	"	520	O. T. Stone	....	Application.
8‡	Tam O'Shanter Creek	"	520	New Canadian Metal Co.	Developed.	
	LILLOOET WATER DISTRICT—					
1†	Bridge River	Fraser River	147,000	Bridge River Power Co.	....	Data submitted by company.
2*	Cayoosh Creek	"	2,000-5,000	....	....	1913 Report, p. 51.
4†	Portage Creek	Seton Lake	900	Portage Creek Power & Light Co.	....	Application.
	NANAIMO WATER DISTRICT—					
2†	Campbell River	Seymour Narrows	85,000	Campbell River Power Co.	....	Data submitted by company
4†	Englishman's River	Strait of Georgia	840	British Pacific Hydro-Elec. & Tramways, Ltd.	....	" "
5*	Little Qualicum River	"	...	....	....	1913 Report, p. 40.
6‡	Millstone River	"	1,300	Nanaimo Elec. Light, Power & Heating Co.	Partial development.	
7*	Nanaimo River	"		....		
	Site No. 1	" 5,000		....		
	Site No. 2	" 11,200		....		
	Site No. 3	" 6,800		....		
	Site No. 4	" 3,000		....		
			26,000	....	....	Engineer's report.
9‡	Puntledge River	Comox Harbour	22,500	Canadian Collieries, Ltd.	12,000-horse-power plant in operation.	
10*	"	"	4,600	....	Site below Canadian Collieries development.	1913 Report, p. 40.
	NELSON WATER DISTRICT—					
5‡	Kootenay River	Columbia River	16,300	West Kootenay Light & Power Co.	Lower Bonnington Falls; 4,000 horse-power developed.	
6*	"	"	36,000	....	Bonnington Pool Falls	1912 Report, p. 34.

7‡	Kootenay River	Columbia River	6,850	City of Nelson	Upper Bonnington Falls; 4,000 horse-power developed.	
8‡	„	„	23,000	West Kootenay Light & Power Co.	Up. Bonnington Falls; 16,000 horse-power developed.	
9*	„	„	....	....	Site at Granite Bridge	1912 Report, p. 34.
10*	„	„	20,000	....	Canyon near Thrums	„ p. 34.
12†	Pend d'Oreille River	„	84,000	Pacific Exploration Co.	Near junction with Columbia	1912 Report, p. 36, and application.
13*	„	„	24,500	....	9 miles from mouth	1912 Report, p. 36.
14*	„	„	26,000	....	15 miles from mouth	„ p. 36.
15*	„	„	38,000	....	At junction with Salmon River	„ p. 36.
20*	Salmon River	Pend d'Oreille	4,000	....	....	„ p. 38.
22†	Sheep Creek	Salmon River	800	Motherlode Sheep Crk. Min. Co.	....	Data submitted by company.
23A†	„	„	640	Amalgamated Gold Mines of Sheep Creek, Ltd.	....	Application.
23B†	„	„	800	R. H. Leach	....	„
	NEW DENVER WATER DIST.—					
5†	Four-mile Creek	Slocan Lake	1,000	G. H. Aylard	....	„
	NEW WESTMINSTER DISTRICT—					
1†	Chehalis River	Harrison River	22,000	Canadian Pacific Rly.	Joint scheme with Statloo River gives 37,000 horse-power	Data submitted by company.
2†	Chilliwack River	Fraser River	70,000-100,000	Vancouver Power Co., Ltd.	....	„ „
3‡	Coquitlam and Buntzen Lakes	Fraser River and North Arm, Burrard Inlet	84,000	Vancouver Power Co., Ltd.	Developed.	
4†	Green River	Lillooet Lake and River	16,000	Nairn Falls Power Co.	....	Data submitted by company.
6†	Jones Lake	Jones Creek	29,000	Vancouver Power Co., Ltd.	....	„ „
7†	Lillooet River	Pitt River	25,000	Burrard Power Company	....	„ „
10†	Pemberton Creek	Lillooet River and Harrison Lake	950	Pacific Great Eastern Development Company	Only small portion of power staked	Application.
11†	Rushfon Creek	Pitt Lake	1,000	E. J. Fader	....	Application and B.C. Hydrographic Survey Report, 1913, p. 123.
13†	Statloo River	Harrison River	15,000	Canadian Pacific Rly.	*See* Chehalis River, No. 1.	
14‡	Stave River	Fraser River	15,000	Western Can. Power Co., Ltd.	50,000 horse-power developed.	
15†	Tamihy Creek	Chilliwack River	8,000	S. Fader	....	Application.
16‡	Munro Creek	Pitt River	1,200	Gilley Bros., Ltd.	550 horse-power developed.	
	PRINCE RUPERT DISTRICT—					
1†	Ain River	Masset Inlet	7,800	British Canadian Lumber Corporation	....	Data submitted by company.
2†	American Creek	Bear River	7,200	R. M. Stewart	....	Application.
4†	Browns Creek	Ecstall River	8,000	Browns Sawmill Development	....	„
5†	Cascade Creek	Salmon and Bear Rivers	1,200	Salmon Bear River Mining Co., Ltd.	....	„
7‡	Falls River	Ecstall River	15,000	Prince Rupert Hydro-Elec. Co., Ltd.		
8†	Glacier Creek	Goose Bay	720	J. L. Parker	....	„
13†	Khtada River	Skeena River	10,000	Prince Rupert Hydro-Elec. Co., Ltd.	....	Data submitted by company.
15§	Kitsumgallum River	„	6,000	....	....	
16†	Kumeolon Creek	Grenville Channel	2,500	Grenville Development Co., Ltd.	....	Application.
19†	Madeleine Creek	Ecstall River	3,200	Prince Rupert Hydro-Elec. Co., Ltd.	....	„
22*	McKnight Creek	„	3,200	....	....	„
23†	Meziadin River	Nass River	...	Canadian North Eastern Power Co., Ltd.		
24*	Mountain River	Rennell Sound	4,800	....	....	Application.
27*	Nass River	Portland Inlet	150,000	....	....	Surveyor's estimate.

* Powers available. † Powers staked. ‡ Powers developed and under development. § Powers available, investigated by Conservation Commission of Canada.

WATER-POWERS OF 500 HORSE-POWER AND OVER—*Continued.*

No.	Creek.	Tributary of.	H.P.	Applicant or Licensee.	Remarks.	Source of Information.
	PRINCE RUPERT DISTRICT—*Concluded.*					
28†	Kawon River (Quan)	Masset Harbour	650	British Canadian Lumber Cor., Ltd.	....	Application.
29*	Raney River	Rennell Sound	2,150	....	....	"
32†	Thulme River	Wark Channel	8,000	Corporation of Prince Rupert	....	"
33*	Twin River	Rennell Sound	1,200	....	....	"
36‡	Woodworth Lake	Fern Passage	1,650	City of Prince Rupert	1,650 horse-power developed at present.	
37§	Aaltanhash River	Graham Reach	5,800	....		
39§	"A" Tributary	Brim River	1,000	....		
40§	Dome River	Aaltanhash Inlet	2,000	....		
41§	Inlet Creek	Gardner Canal	800	....		
42§	Kiltuish River	"	2,500	....		
43§	Lizette Creek	Mussel Inlet	4,500	....		
44§	McAlpine Creek	"	1,500	....		
45§	Mussel Creek	"	3,500	....		
46§	Poison Cove River	"	2,000	....		
47§	Price River	Gardner Canal	500	....		
48§	See-kwya-kin River	Kemano River	600	....		
49‡	Swanson Bay River	Graham Reach	1,250	Swanson Bay Forests, Wood, Pulp & Lumber Mills, Ltd.	Developed.	
50§	Ta-cha-stes Creek	Kemano River	1,600	....		
51§	Triumph River	Gardner Canal	4,500	....		
52§	Wachwas Creek	"	900	....		
53†	Carter River	Finlayson Channel	5,000	Carter River Power Co.	....	Application.
54†	Cougar Lake, etc.	Surf Inlet	900	Surf Inlet Power Co., Ltd. ..	....	"
55‡	Falls Creek	Observatory Inlet	7,325	Granby Consolidated Mining & Smelting Co.	7,325-horse-power plant installed.	
	PRINCETON WATER DISTRICT—					
1*	Ashnola River	Similkameen River	2,000	....	....	Data uncertain.
2†	Nchumpshan Creek	"	1,600	South Okanagan Power Co. ..	....	Application.
5*	Similkameen River	Okanagan River	...	....	Near Junction of Roche and Passayton Rivers.	
6‡	"	"	1,600	Daly Reduction Co., Ltd. ...	Developed.	
7†	"	"	2,200	Ashawota Power Co.	....	Application.
8*	Susap Creek	Similkameen River	650	....	....	Data uncertain.
11‡	Twenty-mile Creek	"	525	Daly Reduction Co.		
	QUESNEL WATER DISTRICT—					
3†	Niagara River	Quesnel Lake	800	Jovian Power Co.	....	Application.
6†	Spanish Lake, etc.	Quesnel River	...	L. Muller	....	"
7†	Swamp River	"	...	Atlas Power Co., Ltd., and Cariboo Power Co., Ltd.	....	"
	REVELSTOKE WATER DISTRICT—					
1*	Akolkolex Creek	Columbia River	4,000	....	....	B.C. Hydrographic Survey Report, 1913, p. 295; 1914, p. 431.
2*	Gold Creek West	"	...	....	Averages 5,000 horse-power per mile	Water Rights Branch, 1912 Report, p. 32.
3‡	Illecillewaet River	"	2,300	Revelstoke Power & Light Co.	Developed.	
6*	Smith Creek	"	...	....	Averages 1,400 horse-power per mile	1912 Report, p. 34.
7*	Soard Creek	"	...	....	Averages 2,800 horse-power per mile	" p. 32.

	Vancouver Water District—					
1*	Ashloo Creek	Squamish River	2,000	....	....	Data uncertain.
3†	Brandt Creek	Indian River	1,500	Westminster Power Co.	*See* No. 17.	
5‡	Britannia Creek	Howe Sound	2,275	Britannia Mining & Smelting Co.	Developed (total power on creek).	
6‡	Buntzen Lake	Burrard Inlet	84,000	Vancouver Power Co., Ltd.	Developed (*see* No. 3, New Westminster District joint scheme).	
8†	Cedar Creek	Howe Sound	2,000	G. F. Whalen	....	Application.
9*	Chapman Creek (Mission Creek)	Gulf of Georgia	800	....	....	Engineer's Report.
10†	Cheakamus River	Squamish River	34,000	British Columbia Power & Electric Co., Ltd.	There are other power-sites on this river which have not yet been investigated	Data submitted by company.
14†	Furry Creek	Howe Sound	3,000	Howe Sound Power Co.	....	" "
15†	Hixon Creek	Indian River	11,000	Westminster Power Co.	*See* No. 17.	
16§	Huaskin Lake	Drury Inlet	1,800	....		
17†	Indian River	Burrard Inlet 9,600		Westminster Power Co. ...	All included in one scheme of development.	
	Brandt Creek	Indian River 1,500		" " ...		
	Hixon Creek	" 11,000		" " ...		
	Norton Creek	" 4,700		" " ...		
	Young Creek	" 4,700		" " ...		
			31,500	....	....	Data submitted by company.
18‡	Jane Creek	Britannia Creek	900	Britannia Creek Mining & Smelting Co., Ltd.	Joint scheme with Marmot Creek (*see* Nos. 5 and 22).	
19†	Lloyd Creek	Homfray Channel	2,000	Crescent Sand & Gravel Co.	....	Application.
20†	Mamquam River	Howe Sound	7,200	Newport Water Co., Ltd.	....	"
21*	"	"	4,500	....	....	"
22‡	Marmot Creek	Britannia Creek	900	Britannia Mining & Smg. Co., Ltd.	Joint schemes with Jane Creek (*see* Nos. 18 and 5).	
23‡	Mill Creek	Howe Sound	2,000	B.C. Sulphite Fibre Co.	Partly developed.	
25†	Monmouth Creek	Squamish River	900	Pacific Great Eastern Development Co.	....	Data submitted by company.
26§	Necleetsconnay River	North Bentinck Arm	2,500	....		
27†	Norton Creek	Indian River	4,700	Westminster Power Co.	*See* No. 17.	
28‡	Powell River	Malaspina Strait	32,000	Powell River Pulp Co., Ltd.	24,000 horse-power already developed.	
30†	Sallust Creek	Burrard Inlet	1,170	Consolidated Contractors, Ltd.	....	Application.
31†	Shannon Creek	Howe Sound	1,700	Newport Brick & Tile Co.	....	Data submitted by company.
34†	Stafford River	Loughborough Inlet	4,000	Davidson Ward Co.	....	Application.
35*	Stony Creek	Cheakamus River	5,000	....	....	Surveyor's estimate.
36*	Tastsquam River	Bella Coola River	3,000	....	....	"
39†	Young Creek	Indian River	4,700	Westminster Power Co.	*See* No. 17.	
40§	Brem River	Toba Inlet	4,000	....		
41§	Canyon Creek	South Fork, Toba River	17,000	....		
42§	Chewson Creek	Toba Inlet	5,000	....		
43§	Dalley River	Rivers Inlet	700	....	2 sites.	
44§	Dean River	Dean Channel	1,200	....		
45§	Doos River	Rivers Inlet	6,000	....		
46§	Eckheimick River	Bute Inlet	4,000	....		
47§	Falls Creek	North Fork, Toba River	5,000	....		
48§	Forbes River	Homfray Channel	1,000	....		
49§	Genesse Creek	Rivers Inlet	2,000	....		
51§	Hatchery Creek	"	1,000	....		
52§	Hazel Creek	Toba River	3,500	....	At Mackenzie Falls.	
53§	Ice River	Bute Inlet	2,500	....		
54§	Ickna Creek	South Bentinck Arm	4,000	....		
55§	Indian River	Rivers Inlet	1,400	....		
56§	Klinaklini River	Knight Inlet	15,000	....		
58§	Memeky River	Salmon River (Johnstone Strait)	1,550	....	2 sites.	

* Powers available. † Powers staked. ‡ Powers developed and under development. § Powers available, investigated by Conservation Commission of Canada.

WATER-POWERS OF 500 HORSE-POWER AND OVER—*Concluded.*

No.	Creek.	Tributary of.	H.P.	Applicant or Licensee.	Remarks.	Source of Information.
	VANCOUVER WATER DISTRICT—*Concluded.*					
60§	Moses Creek	Rivers Inlet	600	....		
62§	Neechantz River	Rivers Inlet	1,000	....		
63§	Noscall River	Dean Channel	7,000	....		
64§	Nusash River	"	600	....		
65§	Owens Creek	North Fork, Toba River	2,000	....		
66§	Rodell Creek	Bute Inlet	3,000	....		
67§	Salmon River	"	4,500	....		
68§	"	Johnstone Strait	1,200	....		
69†	Sandle Lake	Rivers Inlet	3,000	Good Hope Cannery Co.	Partly developed.	
70§	Scow Quiltz River	Dean Channel	4,000	....		
71§	Seymour River	Seymour Inlet	4,000	....		
72§	Sheemahantz River	Rivers Inlet	4,500	....		
73§	Sim Creek	Knight Inlet	6,500	....		
74§	Slide Creek	"	3,000	....		
75§	Summit Creek	South Fork, Toba River	1,500	....		
76§	Tahumming Creek	Toba Inlet	1,000	...		
77§	Talcomy River	South Bentinck Arm	1,400	...		
79§	Thomlinson Creek	South Fork, Toba River	5,500	....		
80§	Toba River (South Fork)	Toba Inlet	4,700	....		
81§	Little Toba River	"	1,600	....		
82§	Twenty-two-mile Creek	Bute Inlet	3,000	....		
84§	Unnamed river	Ellerslie Channel	1,800	....		
85§	"	"	2,000	....		
86§	Wah-kash Creek	Knight Inlet	6,000	....		
88§	White River	Johnstone Strait	5,000	....		
89‡	Scott-Goldie Creek (Crocker Creek)	North Arm, Burrard Inlet	1,500	Scott-Goldie Quarry Co., Ltd.	Partly developed.	
90‡	Link River	Dean Channel	12,500	Ocean Falls Co., Ltd.	Developed.	
91‡	Granite Falls Creek	Vancouver	...	Coast Quarries, Ltd.	Partly developed; information incomplete.	
	VERNON WATER DISTRICT—					
2†	Mission Creek	Okanagan Lake	1,000	Belgo-Canadian Fruitlands Co.	....	Application.
3†	Shuswap River	Mabel Lake	1,200	Couteau Power Co.	....	Data submitted by company.
4†	"	"	4,150	"	....	" "
	VICTORIA WATER DISTRICT—					
5‡	Goldstream	Saanich Arm	2,500	B.C. Elec. Rly.	Developed.	
6†	Gordon River	....	10,000	British Pacific Hydro-Elec. & Tramways, Ltd.	....	Application.
8‡	Jordan River	....	25,000	Vancouver Island Power Co.	Developed.	
10†	Nitinat River	Nitinat Lake	720	Central Island Power Co.	....	Application.
11†	Nimpkish River	Broughton Strait	67,000	E. L. Kinman	....	"
15†	McGoogin Creek	Nitinat River	6,000	J. R. McKinnel and others	....	"
17§	Amazon Creek	Quatsino Sound	1,100	....		
18§	Benson River	"	1,000	....		
19†	Kokish River	Broughton Strait	10,000	White Bros. Lumber Co.	....	Application.
20§	Marble Creek	Quatsino Sound	8,200	Colonial Lumber Paper Mills, Ltd. (one site only)	Total for 3 sites.	
23§	Upper Nimpkish River	Broughton Strait	3,500	....	Camosin Canyon.	
24§	"	"	3,000	....	Big Falls above Moss River.	
25§	"	"	1,500	....	Above mouth of Davie Creek.	
26§	Quatze River	Hardy Bay	500	....		

27§	Raging River	Quatsino Sound	1,500	....		
28§	Shushartie River	Queen Charlotte Sound	1,200	....		
29§	Tsi-itka River	Johnstone Strait	500	....		
	Windermere Water Dist.—					
1*	Findlay Creek	Kootenay River	6,400	....	Total of several powers of 2,000 horse-power and under	1913 Report, p. 77.
2*	Forster Creek	Columbia River	4,000	....	Total of 2 sites	„ p. 77.

* Powers available. † Powers staked. ‡ Powers developed and under development. § Powers available, investigated by Conservation Commission of Canada.

APPENDIX No. 2.

HOW TO ACQUIRE A "CLASS A" OR "CLASS B" LICENCE TO TAKE AND USE WATER.

The Province has been divided into thirty-one "Water Recording Districts," the boundaries of which follow as nearly as possible the main watersheds, and a "Local Recorder," in most cases the Government Agent, appointed for each district. The Local Recorder acts as a "Recorder," the active administration in the more important districts being in the hands of a "District Engineer," whose duties are defined by the "Water Act, 1914," and who is subject to the Comptroller of Water Rights, whose office is at Victoria, B.C., and in whom alone is vested the power to approve an application and grant a licence. The printed forms of notice, application, etc., may be obtained on application to the office of any Water Recorder, District Engineer, or to the Comptroller's office.

Licences may be granted for the use of water for any of the following purposes: Domestic, waterworks, mineral-trading, irrigation, mining, steam, fluming, hydraulicking, industrial, power, clearing-streams, storage, conveying, and lowering-water.

As the water may be required in varying quantities, the applications have been classified as follows: "Class A," "Class B," and "Class C," the definitions of these classes being as follows:—

"Class A," in reference to any application or licence, means any application or licence for "domestic," "mineral-trading," or "steam purpose"; or for "mining" or "industrial purpose" where the water is to be used in quantities not exceeding 100,000 gallons per day; or for "irrigation purpose" where the acreage to be irrigated does not exceed 640 acres; or for "power purpose" where the power to be developed does not exceed 100 horse-power and is to be used by the applicant only: Provided that, if in the opinion of the Comptroller the nature of the works intended is such as to require the submission of detail plans, he may place any application which might come within the foregoing classification into "Class B" notwithstanding the foregoing limitations:

"Class B," in reference to any application or licence, means an application or licence for "mining" or "industrial purpose" where the water is to be used in quantities exceeding 100,000 gallons per day; for "irrigation purpose" where the acreage to be irrigated exceeds 640 acres; or for "storage purpose" or "hydraulicking purpose" or "clearing-streams purpose" or "fluming purpose" where the water is to be used by the applicant only; or for "power purpose" where the power to be developed exceeds 100 horse-power and is to be used by the applicant only; or for "lowering-water purpose": Provided that, if in the opinion of the Comptroller the nature of the works is such as not to require the submission of detail plans, he may place any application or licence which might come within the above classification into "Class A" notwithstanding the foregoing limitations:

"Class C," in reference to any application or licence, means a licence by virtue of which water is held in gross, whether by special Statute or otherwise; or an application or licence for "power," "hydraulicking," "clearing-streams," or "fluming purposes" where tolls are to be charged; or for "waterworks" or "conveying purposes."

A licence in respect of a "Class A" or "Class B" application can be obtained by an "owner," "owner" being defined by the Act as:—

(*a.*) Any registered owner in the book of indefeasible or absolute fees in any Land Registry Office in the Province:

(*b.*) Any purchaser or lessee in a registered agreement for purchase or lease:

(*c.*) Any applicant to register his title as owner or his agreement for purchase or lease:

(*d.*) Any pre-emptor, homesteader, or purchaser from the Crown in the right of either the Dominion or the Province, or any applicant to so pre-empt, homestead, or purchase:

(*e.*) Any timber licensee or lessee:

(*f.*) Any other lawful occupant of land or of a mine:
(*g.*) Any legal representative of an owner (as herein defined) who has died, become insolvent, is a minor, is of unsound mind, or is otherwise under disability:
(*h.*) Any receiver or liquidator of a company which is the owner (as herein defined) of land.

A licence in respect of a "Class C" application can only be acquired by a municipality empowered by an Act of the Legislature or to a company authorized by its memorandum of association or by some Act of the Legislature to acquire such licence, and in no case until the undertaking has been approved under the "Water Act, 1914."

The initial procedure to obtain a "Class A" or "Class B" water licence is as follows:—

(1.) Post notices at or near the point of diversion and place of use:
(2.) File the notice in duplicate in the office of the Water Recorder for the district in which the proposed point of diversion is situate:
(3.) At the same time as filing serve the notice upon each owner whose land will be touched or in any way affected by the proposed works:
(4.) Forthwith after posting on the ground, advertise the notice in a local newspaper once a week for four weeks:
(5.) Within ten days after the date of the first publication, file the formal application in duplicate in the Water Recorder's office.

The following is a more detailed summary of the procedure of the requirements of the "Water Act":—

First Step—Posting Notices.

The applicant shall post on the ground at conspicuous points near the proposed point of diversion and proposed place of use a notice of his intention to apply for a licence; although printed forms are supplied, the Act does not require that the notice follow any particular form, but it must give the following particulars:—

(*a.*) The name and address of the applicant:
(*b.*) The Water Recorder's office in which the application is to be filed:
(*c.*) The name or a clear description of the stream the water of which is to be diverted or used:
(*d.*) The quantity of water applied for in acre-feet per annum, cubic feet per second, gallons per day, or miners' inches:
(*e.*) The proposed point or points of diversion:
(*f.*) The purpose for which the water is to be used:
(*g.*) The number of the lot or section (and, if subdivided, the number or description of the subdivision) of the land or mine, and, if a mine, the name of the mine, upon which land or mine the water or power is to be used:
(*h.*) The date when the notice was posted on the ground.

Second Step—Filing and serving Copies of the Notice.

Forthwith after the posting of the notice on the ground as above, notices to the same effect shall be filed in the office of the Water Recorder for the district in which the proposed point of diversion is situate, and served upon each owner whose land will be touched or in any way affected by the proposed works. Proof of this service is required.

Third Step—Advertisement.

A notice giving all the particulars mentioned above, and, in addition, the date of the first publication and stating that objections may be filed with the Comptroller or with the Water Recorder within thirty days from such date, shall forthwith be published once a week for four weeks in a newspaper published in each district affected.

Fourth Step—The Application.

Within ten days from the first appearance of the notice in the local paper, the application, on forms to be supplied, must be filed in duplicate in the office of the Water Recorder where the notice was filed. The sketch on the application form need not be to scale, but must show

the point of diversion, the lands crossed or affected, and generally outlining the scheme. The Local Recorder then forwards the application to the Comptroller, who checks the application and advises the applicant of the further requirements and of the amount of fees payable.

FIFTH AND SIXTH STEPS—ADDITIONAL INFORMATION AND FEES.

The further information and the fees must be filed with the Comptroller within fifty days from the first appearance of the notice in the local paper. The fees to be paid in respect of a licence for irrigation purposes are 5 cents per acre-foot of water applied for, and the annual rental is 2 cents per acre-foot of water granted by the licence.

Conditional Licence.—The Comptroller is now in a position to consider the application for the licence. If a "Class A" application, he may issue a conditional licence wherein he sets a time for the commencement and completion of the works and authorizes the use of the water.

SEVENTH STEP—(CLASS "B" APPLICANTS ONLY).

If a "Class B" application, he may issue an authorization to the applicant to proceed to survey and file plans and specifications of his proposed works, setting the time within which they must be completed and the manner in which they are to be made. These plans and specifications are to be submitted in triplicate, one set of plans being tracings and two sets prints, and must be in such detail that the construction of the works could be carried out from them.

EIGHTH STEP—THE TAKING OF LANDS.

Should the applicant require a right-of-way over Crown or private lands, the following procedure must be followed:—

Provincial Crown Lands.—Address a petition and sketch to the Minister of Lands, but file same with the Comptroller of Water Rights, showing:—

(1.) The number and principal terms of the conditional licence:

(2.) The nature of the easement required:

(3.) The length, breadth, and area of the right-of-way and its location.

Dominion Crown Lands.—Address a petition and sketch to the Minister of the Interior, but file same with the Comptroller of Water Rights, showing and setting out the same details as above.

Private Lands.—Obtain if possible the written consent of the owner of the lands over which a right-of-way is desired. If this is withheld it will be necessary for the applicant to furnish security to the amount set by the Comptroller, after which the Comptroller may give the applicant authority to enter on the lands to be used. Following this latter procedure, it is necessary for the applicant to take all steps necessary, as set out in the "Water Act," for the determination, by arbitration, of the amount which is to be paid by way of compensation for the land which is used.

NINTH STEP—FILING PROOF OF COMPLETION.

Within sixty days of the date set for the completion of the works, the licensee shall file proof of such completion, and the Comptroller, when he has satisfied himself by inspection or otherwise that the work has been carried out in a satisfactory manner, will issue a final licence.

While the above is an outline of the procedure to obtain a licence for the use of water, for full particulars of the rights and obligations of licensees interested parties are referred to the "Water Act, 1914," and the rules and regulations thereunder, copies of which, as well as detailed information and forms, may be obtained from the Comptroller of Water Rights, Victoria, B.C.

APPENDIX No. 3.

THE MEASUREMENT OF WATER.

The object in view in the administration of the water of British Columbia is to make the greatest beneficial use of the water, and in order to obtain this end the measurement of the water is of the greatest importance.

On most of the rivers of any size, and on many smaller streams, the measuring of the discharge is in the hands of expert engineers assisted by local observers, but the large body of the work necessary to obtain the greatest beneficial use must be done by the users themselves.

In most cases it is of advantage to know how much water there is, and how much any one is taking, as this leads to a great deal less trouble and friction where the water-supply is limited; it is also admitted that no one can really make a success of irrigation or utilize the important results made public in the reports of Government experimental work unless they know and can control the amounts of water used for different crops. It is hoped that the rather haphazard arrangements adopted by many irrigators will give place to more careful and studied methods.

It should be noted that by the "Water Act, 1914," 1 cubic foot per second (c.f.s.) is fixed as being equal to 1.98 acre-feet per twenty-four hours, so that 1 c.f.s. will approximately cover 1 acre to a depth of 1 inch in 1 hour; this forms an easy basis for calculation, and is used in the table in Appendix 7, which shows the acre-feet given by various discharges in cubic feet per second over a certain time.

The three main measuring-devices for small amounts of water are the "V" notch, the rectangular weir, and the Cippoletti weir. The "V" notch is useful only with very small amounts; the rectangular weir offers certain difficulties in calculation; but the Cippoletti weir overcomes these, it is simple to measure with, and is therefore adopted as being most suitable for the purpose in view.

How to make and place a Cippoletti Weir.

There are certain fundamental features in the construction and use of a Cippoletti weir that must be understood in order to obtain satisfactory results. It must be made correctly, placed correctly, and kept in good order.

Reference to the illustration will show that the sides of the opening are sloped 1 to 4; that is, for every 4 inches above the crest 1 inch is set off to the right or left.

The weir should be bevelled to a sharp edge on the up-stream face, so that the water passes freely over it and allows room for a small amount of air between the discharged water and the weir; sometimes a sheet of metal is used, and the weir cut out of that, or the wooden edge may be covered by a metal strip to prevent its being damaged and so losing its shape.

The following points should be carefully observed:—

(1.) The weir should be set at right angles to the stream, should be perpendicular, and the crest exactly horizontal.

(2.) The width from the edge of the slope to the bank should not be less than three times the depth of water flowing over the crest, so that if the weir is designed for a maximum discharge of 12 inches of water, there should be at least 3 feet clear to the bank each side.

(3.) The depth of water below the crest on the up-stream side should also be at least three times the depth of water passing over the crest, and arrangements should be made by a sluice-gate or otherwise to keep this depth clear.

(4.) There must be a free fall on the down-stream side.

(5.) It is important that as far as possible the water should approach the weir slowly, and without eddies or cross-currents. To obtain this, the weir should be placed in a straight length of channel where possible, and at such a height that a considerable pool is formed behind it.

How to measure the Discharge.

It will be noticed that where the water passes over the crest there is a slight curve in the upper surface, so to measure the correct depth it is necessary to place a peg from 6 to 10 feet from the weir, with the top exactly level with the crest, and to measure the water from the top of the peg; this depth is also called the head of water.

On referring to the table given, the head expressed in inches is shown on the left hand, and opposite this is given the discharge over a 1-foot weir. The discharge varies directly as the width of the crest, so for a 5-foot weir the figure given would be multiplied by 5, and similarly in any other case.

What Size to make the Weir.

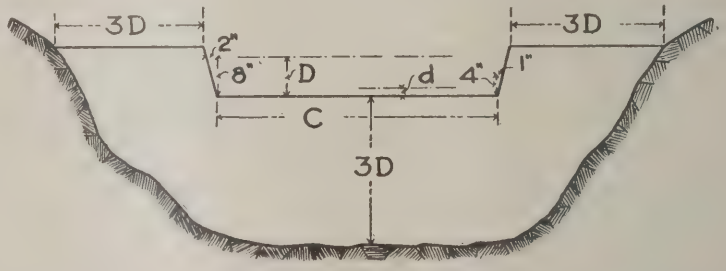
To obtain good results from the use of Cippoletti weirs it is also necessary to keep the depth of water flowing over the weir within certain limits; this is obtained by varying the width to suit the particular requirements in each case. The depth of water should not be less than 2 inches, nor more than one-third of the length of crest; so within these limits a—

1-foot weir can be used for discharges from ¼ to 1 c.f.s.

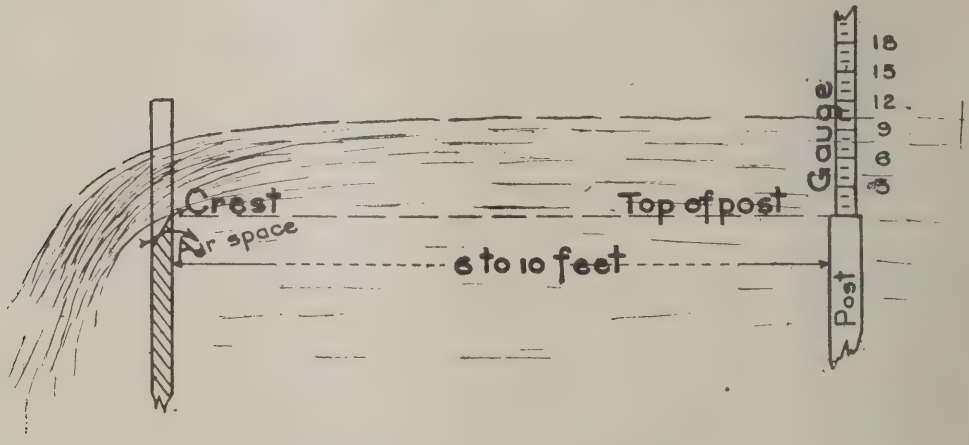
2-foot weir can be used for discharges from ½ to 3½ c.f.s.
3-foot weir can be used for discharges from ¾ to 10 c.f.s.
4-foot weir can be used for discharges from 1 to 20 c.f.s.
5-foot weir can be used for discharges from 1¼ to 35 c.f.s.
6-foot weir can be used for discharges from 1½ to 55 c.f.s.
7-foot weir can be used for discharges from 1¾ to 80 c.f.s.
8-foot weir can be used for discharges from 2 to 115 c.f.s.
9-foot weir can be used for discharges from 2¼ to 155 c.f.s.
10-foot weir (with 2 to 36 inches depth of water) can be used for discharges from 2½ to 175 c.f.s.
15-foot weir (with 2 to 36 inches depth of water) can be used for discharges from 3½ to 260 c.f.s.
20-foot weir (with 2 to 36 inches depth of water) can be used for discharges from 4¾ to 350 c.f.s.

It will be seen there may be a considerable choice as to size, but it is best to select the one that will give the most correct measurements at the lowest discharge. The width of the watercourse and the grade will also influence the size of weir-crest.

Any inquiries as to the width most suitable in any particular case should be addressed to the Comptroller of Water Rights, giving full particulars as to width of channel, height and nature of banks, grade of watercourse, and the range of discharge required to be measured.



Cippoletti weir. C=Crest, or length of weir, D=Maximum depth of water on crest=one-third length of crest, but not more than 3 feet. d=Minimum depth of water on crest=2 inches.



Section of weir showing peg for measurement purposes.

TABLE OF DISCHARGE IN CUBIC FEET PER SECOND OVER A CIPPOLETTI WEIR ONE FOOT WIDE.

Head in Inches.	Discharge in C.F.S.	Head in Inches.	Discharge in C.F.S.	Head in Inches.	Discharge in C.F.S
1	0.08	4⅝	0.81	10½	2.75
1⅛	0.10	4¾	0.84	10¾	2.85
1¼	0.11	4⅞	0.87	11	2.95
1⅜	0.13	5	0.91	11¼	3.05
1½	0.15	5⅛	0.94	11½	3.15
1⅝	0.17	5¼	0.97	11¾	3.26
1¾	0.19	5⅜	1.01	12	3.37
1⅞	0.21	5½	1.04	12¼	3.47
2	0.23	5⅝	1.08	12½	3.57
2⅛	0.25	5¾	1.12	12¾	3.68
2¼	0.27	5⅞	1.15	13	3.79
2⅜	0.30	6	1.19	13¼	3.90
2½	0.32	6¼	1.26	13½	4.02
2⅝	0.34	6½	1.34	13¾	4.13
2¾	0.37	6¾	1.42	14	4.24
2⅞	0.40	7	1.50	14¼	4.35
3	0.42	7¼	1.58	14½	4.47
3⅛	0.45	7½	1.66	14¾	4.58
3¼	0.47	7¾	1.75	15	4.70
3⅜	0.50	8	1.83	15¼	4.82
3½	0.53	8¼	1.92	15½	4.94
3⅝	0.56	8½	2.01	15¾	5.06
3¾	0.59	8¾	2.10	16	5.18
3⅞	0.62	9	2.19	16¼	5.30
4	0.65	9¼	2.28	16½	5.42
4⅛	0.68	9½	2.37	16¾	5.55
4¼	0.71	9¾	2.46	17	5.68
4⅜	0.74	10	2.56	17¼	5.80
4½	0.77	10¼	2.66	17½	5.93
...	...	...	...	17¾	6.06
...	...	...	...	18	6.18

APPENDIX No. 4.

GRIZZLY BAR, OR SELF-CLEANING INTAKE AND DIVERSION.

Specification.—The box, which should be constructed of not less than 2-inch lumber, to be set in a trench cut across the creek, the top of box being flush with creek-bed. Box to be 2 inches wide by 1 foot 6 inches deep at shallow end, sloping to 2 feet deep where it terminates at the sluice-gate, at the connection to the flume. The length to be determined by local conditions, but should be only sufficiently long so that the sluice-gate and flume thereto can be conveniently located. Wing-boards and aprons of substantial size, depending on the particular site where the box is installed, to be provided, great care being exercised that the foot-steps are sunk sufficiently deep to avoid the possibility of the water getting underneath the box.

Grizzly bars to be fixed across top of box, the sides of the box being so shaped that the bars in the centre of the stream will be lower than those at the side. The middle 3 feet of bars to be sunk 1 inch lower than the sides in order that two pieces of ⅛-inch sheet iron or steel, each 2 feet by 1 foot 6 inches, may be set therein. These plates to be set prior to the spring floods, so that the greater quantity of water and gravel passing down the creek may be carried over the box and so prevent it choking.

A sluice-gate to be provided and fixed on the side of the lower end of the box, in order that all gravel and sand may be automatically discharged through a flume to the creek at a point below the grizzly bars.

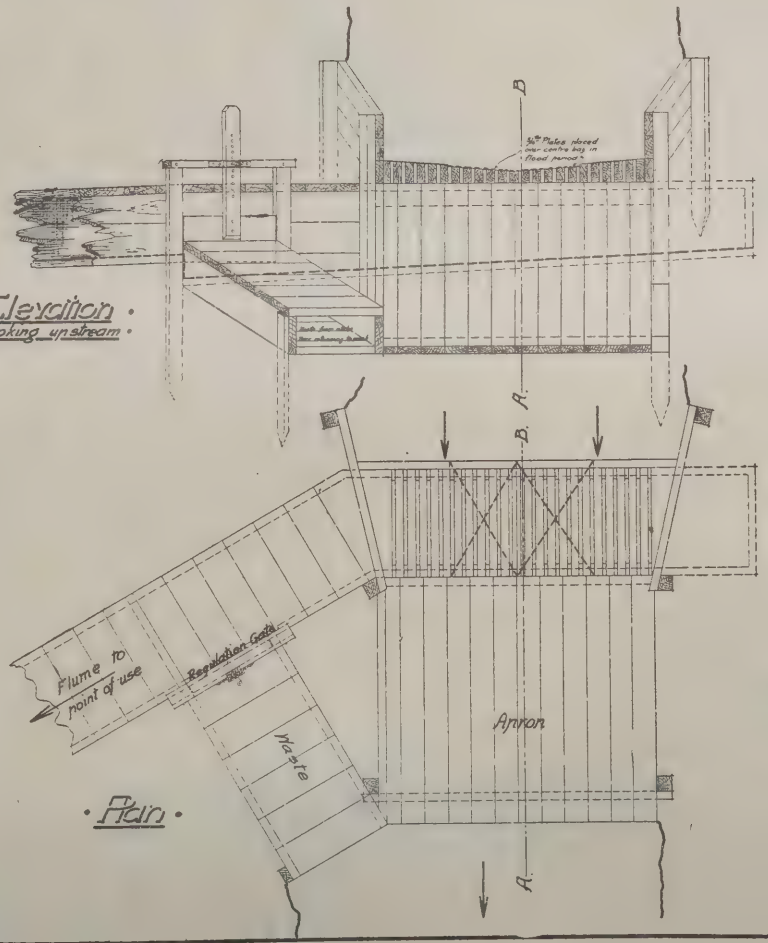
PROVINCE OF BRITISH COLUMBIA

Lands Department Water Rights Branch

GRIZZLY BAR OR SELF CLEANING INTAKE

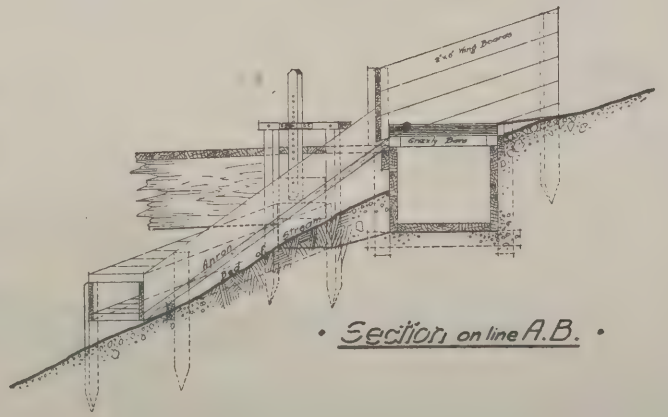
for Mountain Creek

Scale one inch = one foot



Elevation looking upstream

Plan



Section on line A.B.

APPENDIX No. 5.

IRRIGATION HEADGATES.

FARMER'S HEADGATE.

The farmer's small headgate shown in Fig. 1 will deliver up to 4 second-feet in the ditch below under favourable conditions of grade and size, assuming the gate-box can be kept full of water.

It will be noticed that the two inner planks of the front wings extend 1 inch beyond the inner face of the side-walls, thus forming front guides. The extension of the two planks in the front cut-off wall above the floor-boards by an inch makes a tighter gate; the gate fits down behind them.

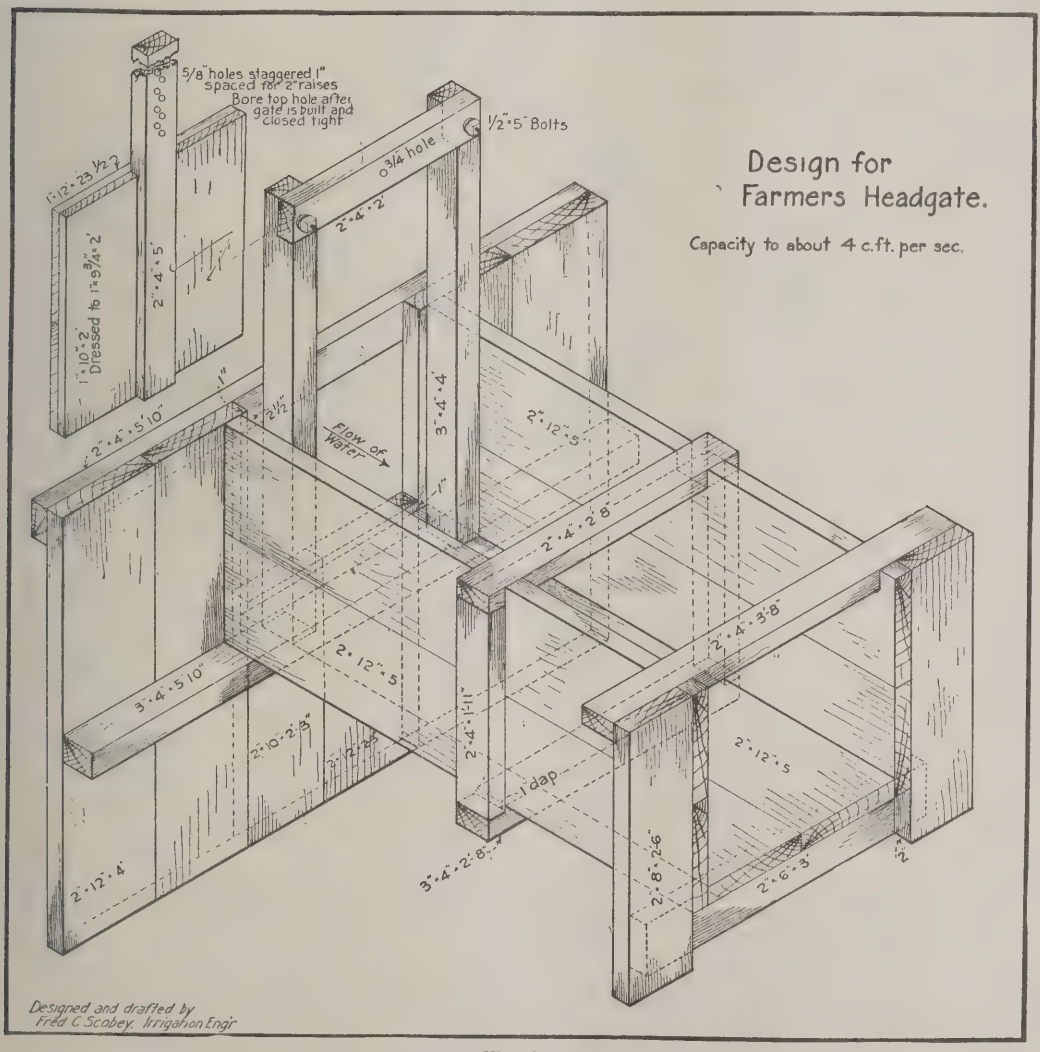

Design for
Farmers Headgate.
Capacity to about 4 c.ft. per sec.
5/8" holes staggered 1" spaced for 2" raises
Bore top hole after gate is built and closed tight
1/2"x5" Bolts
3/4 hole
Flow of Water
Dap
Designed and drafted by
Fred C. Scobey, Irrigation Engr

Fig. 1.

If possible, the stem of the gate should be hardwood and the holes bored therein staggered as shown; 5/8-inch holes will take a 1/2-inch pin, which could have an iron ring at one end and a small slot at the other to receive the tongue of a thin padlock.

The dimensions of lumber are suited to a structure of the size indicated; a considerable increase in size would need other dimensions and a rearrangement of struts and braces.

The depth of the wing and front walls must be determined by the nature of the soil; one of sand would require a greater depth than those shown. Whatever depth be decided on, the dirt excavated must be well puddled round the walls, thoroughly tamped down with a rammer, previously having been worked to the consistency of stiff mortar. If the dirt be replaced in a dry state, carelessly shovelled in, there is every likelihood of a washout.

SMALL LATERAL HEADGATE.

The small lateral headgate shown in Fig. 2 is 3 feet high and 3 feet wide, with a capacity of about 15 second-feet under favourable conditions.

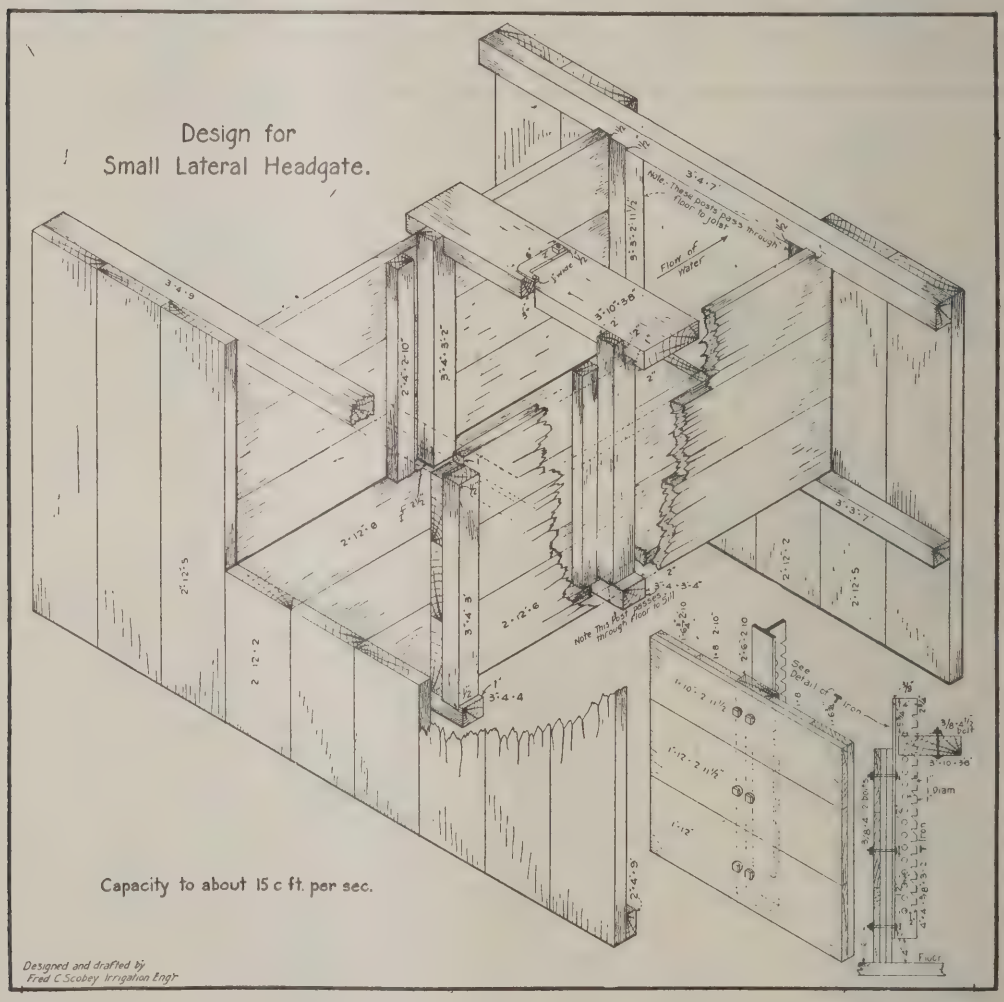

Design for
Small Lateral Headgate.
Capacity to about 15 c ft per sec.
Designed and drafted by
Fred C Scobey Irrigation Engr

Fig. 2.

Should it be preferred, angle-iron can be used instead of a T-iron as a stem; it costs less. The gate is raised by means of a short crowbar inserted in the notches and used as a lever.

The same care should be taken to carefully install this type of gate as the farmer's small headgate; if necessary, the vertical planks of the wing-wall can be driven down with a wooden mallet, and cut to length after.

Timber should be notched and fitted as shown in the drawings; whilst this entails slightly more labour at the time, it adds a great deal to the strength and stiffness of the structures.

Bills of material for both types of gates are appended; the lateral type has quantities for three sizes.

Farmer's Headgate. Capacity up to about 4 Second-feet (depending on Grade and Condition of the Ditch below the Gate).

Bill of Lumber.

Use.	Pieces.	Dimensions.	Feet, B.M.
Side boards	4	2″ x 12″ x 5′	40
Floor	2	2″ x 12″ x 5′	20
Front wings	4	2″ x 12″ x 4′	32
Front cut-off wall	1	2″ x 12″ x 2′ 3″	5
„ „ „	1	2″ x 10″ x 2′ 3″	4
Cap	1	2″ x 4″ x 5′ 10″	4
Joist	1	3″ x 4″ x 5′ 10″	6
Gate-posts	2	3″ x 4″ x 4′	8
Cap for gate-posts	1	2″ x 4″ x 2′	1
Sill	1	3″ x 4″ x 2′ 8″	3
Cap	1	2″ x 4″ x 2′ 8″	2
Posts	2	2″ x 4″ x 1′ 11″	3
Lower wings	2	2″ x 12″ x 2′ 6″	10
Cut-off sill	1	2″ x 6″ x 3′	3
Cap	1	2″ x 4″ x 3′ 8″	3
Bolts	2	½″ x 6″	...
Gate-stem	1	2″ x 4″ x 5′	3
Gate-boards	2	1″ x 12″ x 23½″	4
„	2	1″ x 10″ x 2′	4
		Total feet, B.M.	155

Two bolts ½″ x 5″, with washers for each end.

Headgate for Small Lateral. Capacity up to about 15 Second-feet (depending on Grade and Condition of the Lateral below Gate).

(As per Plans in Drawing. Bottom, 3 feet wide; sides, 3 feet high.)

Bill of Lumber.

Use.	Pieces.	Dimensions.	Feet, B.M.
Side boards	6	2″ x 12″ x 6′	72
Floor	3	2″ x 12″ x 6′	36
Front wings	6	2″ x 12″ x 5′	60
Front cut-off wall	3	2″ x 12″ x 2′	12
Joist	1	2″ x 4″ x 9′	6
Sill	1	3″ x 4″ x 4′	4
„	1	3″ x 4″ x 3′ 4″	4
Posts	2	3″ x 4″ x 3′	6
Cap (front wings)	1	3″ x 4″ x 9′	9
Lower wings	4	2″ x 12″ x 5′	40
Lower cut-off wall	3	2″ x 12″ x 2′	12
Joist	1	3″ x 3″ x 7′	5
Posts	2	3″ x 3″ x 2′ 11½″	5
Cap	1	3″ x 4″ x 7′	7
Front guides	2	2″ x 4″ x 2′ 10″	4
Rear guides	2	3″ x 4″ x 3′ 2″	6
Foot-plank	1	3″ x 10″ x 3′ 8″	10
Gate-boards	1	1″ x 10″ x 2′ 11½″	3
„	2	1″ x 12″ x 2′ 11½″	6
„	2	1″ x 8″ x 2′ 10″	4
„	2	1″ x 6¾″ x 2′ 10″	4
„	1	2″ x 6″ x 2′ 10″	3
		Total feet, B.M.	318

T-iron—One piece 4″ x 4″ x ⅜″ x 3′ 2″, bored as per detail.
Bolts—Seven ⅜″ x 4½″, with washers for each end.

HEADGATE FOR SMALL LATERAL. CAPACITY UP TO ABOUT 20 SECOND-FEET (DEPENDING ON GRADE AND CONDITION OF THE LATERAL BELOW GATE).

(As per Plans in Drawing, except 4 feet wide instead of 3 feet wide.)

Bill of Lumber.

Use.	Pieces.	Dimensions.	Feet, B.M.
Side boards	6	2″ x 12″ x 6′	72
Floor	4	2″ x 12″ x 6′	48
Front wings	6	2″ x 12″ x 5′	60
Front cut-off wall	4	2″ x 12″ x 2′	16
Joist	1	2″ x 4″ x 10′	7
Sill	1	3″ x 4″ x 5′	5
,,	1	3″ x 4″ x 4′ 4″	5
Posts	2	3″ x 4″ x 3′	6
Cap (front wings)	1	3″ x 4″ x 10′	10
Lower wings	4	2″ x 12″ x 5′	40
Lower cut-off wall	4	2″ x 12″ x 2′	16
Joist	1	3″ x 3″ x 8′	6
Posts	2	3″ x 3″ x 2′ 11½″	5
Cap (lower wings)	1	3″ x 4″ x 8′	8
Front guides	2	2″ x 4″ x 2′ 10″	4
Rear guides	2	3″ x 4″ x 3′ 2″	6
Foot-plank	1	3″ x 10″ x 4′ 8″	13
Gate-boards (front)	1	1″ x 10″ x 3′ 11½″	4
,, ,,	2	1″ x 12″ x 3′ 11½″	8
,, (back)	2	1″ x 10″ x 2′ 10″	5
,, ,,	2	1″ x 10¾″ x 2′ 10″	5
,, ,,	1	2″ x 6″ x 2′ 10″	3
		Total feet, B.M.	352

T-iron—One piece 4″ x 4″ x ⅜″ x 3′ 2″, bored as per detail.
Bolts—Seven ⅜″ x 4½″, with washers for each end.

Headgate for Lateral. Capacity up to about 28 Second-feet (depending on Grade and Condition of Lateral below Gate).

(As per Plans in Drawing, except 4 feet wide and 4 feet high instead of 3 feet wide and 3 feet high. Cut-off and wing-walls 1 foot deeper.)

Bill of Lumber.

Use.	Pieces.	Dimensions.	Feet, B.M.
Side boards	8	2″ x 12″ x 6′	96
Floor	4	2″ x 12″ x 6′	48
Front wings	6	2″ x 12″ x 7′	84
Front cut-off wall	4	2″ x 12″ x 3′	24
Joist	1	2″ x 4″ x 10′	7
Sill	1	3″ x 4″ x 5′	5
,,	1	3″ x 4″ x 4′ 4″	5
Posts	2	3″ x 4″ x 4′	8
Cap (front wings)	1	3″ x 4″ x 10′	10
Lower wings	4	2″ x 12″ x 7′	56
Lower cut-off wall	4	2″ x 12″ x 3′	24
Joist	1	3″ x 3″ x 8′	6
Posts	2	3″ x 3″ x 3′ 11½	7
Cap (lower wings)	1	3″ x 4″ x 8′	8
Front guides	2	2″ x 4″ x 3′ 10″	5
Rear guides	2	3″ x 4″ x 4′ 2″	8
Foot-plank	1	3″ x 10″ x 4′ 8″	13
Gate-boards (front)	1	1″ x 10″ x 3′ 11½″	4
,, ,,	3	1″ x 12″ x 3′ 11½″	12
,, (back)	2	1″ x 10″ x 3′ 10″	7
,, ,,	2	1″ x 10¾″ x 3′ 10″	7
,, ,,	1	2″ x 6″ x 3′ 10″	4
		Total feet, B.M.	448

T-iron—One piece 4″ x 4″ x ⅜″ x 4′ 2″, bored as per detail (for additional foot).
Bolts—Seven ⅜″ x 4½″, with washers for each end.

APPENDIX No. 6.

OVERIRRIGATION.

Overirrigation:—

(1.) Causes smaller crop yields per unit of water:
(2.) Encourages water-logging and alkali trouble on heavy or low-lying land:
(3.) Leaches out plant-food from coarse soils:
(4.) Causes more plant-food to be used by the plant for each pound of crop produced:
(5.) Causes the quality of crops to be reduced:
(6.) Produces straw at the expense of grain:
(7.) Deprives other lands of irrigation-water:
(8.) Soil air is excluded and unfavourably low soil temperatures are caused by excessive irrigation:
(9.) The community spirit is lower wherever water is wastefully used:
(10.) Overirrigation is the greatest menace to permanently profitable irrigation agriculture:

Proper irrigation makes it possible to build up and keep the soil in a higher state of fertility than is possible by other types of farming.

APPENDIX No. 7.

USEFUL WATER DATA.

DUTY OF WATER.

One second-foot is generally considered sufficient to irrigate 120 acres of land.

One second-foot flowing 120 days equals 240 acre-feet.

One second-foot flowing 120 days would cover it 2 feet in depth. If applied on 100 acres it would cover it 2.4 feet in depth.

Three to four acre-feet capacity in the reservoir is usually considered necessary to irrigate 1 acre of land in addition to overcoming all seepage and evaporation losses.

From 1 to 3 acre-feet on the land, depending upon the kind of crop, and the rainfall in the particular locality, is usually considered sufficient. One acre-foot on the land, if properly distributed, is equal to 12 inches of rainfall.

From 3 to 5 acre-inches is applied for each irrigation, depending upon the kind of crop and the method employed in irrigating.

From 1 to 3 second-feet is usually considered a good irrigation-head. Irrigators on the same stream may secure a better head through the adoption of rotation in use of water.

One-half inch per acre continuous flow is equivalent to 1 inch per acre used every other day or week, or 1½ inches per acre used every third day or third week, rotating with others.

WATER UNITS.

The cubic foot per second is the standard for measuring rate of flow. It is abbreviated sec.-ft., or c.f.s.

One sec.-ft. equals 35.71 miners' inches.

The miners' inch is a very indefinite unit, and its use should be discontinued.

The acre-foot is the standard unit of volume.

One acre-foot equals 43,560 cubic feet; equals ½ sec.-ft. flowing 25 hours; equals 1 acre covered 12 inches deep or 12 acre-inches.

One cubic foot equals 6.25 gallons and weighs 62.5 pounds.

The unit of work is the foot-pound, or the amount of work to overcome a weight of 1 pound falling 1 foot.

Power equals rate of work, equals work divided by time.

One horse-power equals 550 foot-pounds per second.

One horse-power equals 1 cubic foot of water falling 8.8 feet in one second.

To calculate horse-power (theoretical), multiply flow in second-feet by vertical fall in feet, and divide by 8.8.

To calculate net horse-power on wheels of 80 per cent. efficiency, multiply flow in second-feet by fall in feet, and divide by 11.

One and one-third horse-power equals about 1 kilowatt.

TABLE SHOWING ACRE-FEET GIVEN BY VARIOUS DISCHARGES OVER A CERTAIN TIME.

Discharges in Acre-feet for Various Flows for given Time Periods.

	6 Hours.	12 Hours	1 Day.	1½ Days.	2 Days.	2½ Days.	3 Days.	3½ Days.
½ c.f.s.	¼	½	1	1½	2	2½	3	3½
1 „	½	1	2	3	4	5	6	7
2 „	1	2	4	6	8	10	12	14
3 „	1½	3	6	9	12	15	18	21
4 „	2	4	8	12	16	20	24	28
5 „	2½	5	10	15	20	25	30	35
6 „	3	6	12	18	24	30	36	42
7 „	3½	7	14	21	28	35	42	49
8 „	4	8	16	24	32	40	48	56
9 „	4½	9	18	27	36	45	54	63
10 „	5	10	20	30	40	50	60	70

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

FIRST ANNUAL REPORT

OF THE

WORKMEN'S COMPENSATION BOARD

OF THE

PROVINCE OF BRITISH COLUMBIA

FOR THE

YEAR ENDING DECEMBER 31ST

1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir FRANK STILLMAN BARNARD, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The First Annual Report of the Workmen's Compensation Board of this Province is herewith respectfully submitted.

JOHN OLIVER,

Premier.

Premier's Office,

March, 1918.

THE WORKMEN'S COMPENSATION BOARD,

VANCOUVER, B.C., March 11th, 1918.

The Honourable John Oliver, Premier,

Parliament Buildings, Victoria, B.C.

DEAR SIR,—In pursuance of section 50 of the "Workmen's Compensation Act" we enclose herewith Annual Report. Our Board decided that, in addition to the ordinary statement of the transactions of the Board, it would be advisable in the first report to give a general explanation of the different features of the Act, so that it may act along educational lines.

We are,

Yours very truly,

E. S. H. WINN,

Chairman.

REPORT OF WORKMEN'S COMPENSATION BOARD.

To the Lieutenant-Governor in Council,
Victoria, B.C.

SIR,—The "Workmen's Compensation Act," being chapter 77, Statutes of 1916, requires that annually, on or before the 1st day of March, the Workmen's Compensation Board shall make a report of its transactions during the next preceding calendar year. In accordance, therefore, with the requirements of that Act, this report is made. It contains:—

(*a.*) Organization:
(*b.*) A brief outline of what led up to workmen's compensation legislation:
(*c.*) Methods adopted and work performed by the subdivisions of the organization, which comprises:—
(1.) Assessments and audits:
(2.) Claims:
(3.) Medical division:
(4.) Accident-prevention:
(5.) Statistical.

(*a.*) ORGANIZATION.

The members of the Board are: E. S. H. Winn, Chairman, appointed for ten years; Parker Williams, Commissioner, appointed for nine years; and Hugh B. Gilmour, Commissioner, appointed for eight years. The Board held its first meeting on the 8th day of January, 1917, and effected a partial organization. It should be remembered that the Act came into operation on the 1st day of January, 1917. The Commissioners had no previous experience in this class of work, and were unacquainted with each other. The general effect was that the members of the Board started on this immense work some few days after the Act had actually come into operation. One can therefore quite understand the care that must be exercised in the creating of precedents for the years to come. It was most necessary that the foundation should be carefully laid. The members realized the work that had to be done and that a great amount of the Board's future success would depend upon the first year's work. With what amount of success this has been accomplished you may have already formed an opinion.

The Board has been confronted with the task of establishing immediately a complex system of insurance and medical aid, unique in its general plan, broad in its scope, and marking an innovation amongst the laws of its kind, for compensation insurance is new on this continent, no law having been in operation longer than five or six years, and no two compensation laws in the forty-two on the continent where they obtain being the same.

The system was unique, inasmuch as it was the only law of its kind in force at the time that carried with it unlimited medical aid. It is broad in scope, because as of January 1st, 1917, the compulsory features of the Statute became effective, whereby the entire accident business of the industries covered by the Act would fall upon the Board, to be handled equitably, accurately, promptly, and economically.

The background against which the law is operative includes an annual pay-roll of approximately $100,000,000, approximately 75,000 workmen, about 6,000 employing firms, 400 doctors, 2,000 nurses, 200 dentists, 150 druggists, ambulance companies or transportation concerns, including automobile services, teaming, launches—in fact, every kind of transportation facility that was necessary to bring injured workmen to the nearest medical practitioner. These were affected directly, and yet the public as a whole was to be affected almost as vitally, for the establishment of the new law meant a vast change in public policy in the treatment of the least risk from industrial accidents.

The Board had therefore to face the problem of making effective in the most practical manner this new principle which had been embodied in the laws of the Province; to do so meant much pioneer work.

EDUCATION.

The Board realized that the bringing into effect of the provisions of the present Act was to overturn the long-established habits of employers, workmen, doctors, and lawyers—a truly revolutionary proceeding. It meant the abandonment of the Courts as an institution for awarding damages for personal injury by accident, as well as the elimination of the legal profession.

The Board started a Province-wide educational campaign. The members of the Board, as a body, in pairs, or singly, addressed labour bodies, commercial organizations, boards of trade, medical associations, fraternal organizations, and social gatherings, delivering several hundred addresses during the year, explaining the provisions of the law and soliciting co-operation from these bodies as well as the public. The Act when explained appeals strongly to all on economic as well as humanitarian grounds.

Many thousand circular letters were addressed to those affected and many thousand answers to personal inquiries were made. Many difficulties were solved by personal contact with those affected. Interviews with labour unions and committees thereof established a direct communication with the Board, and provided the elimination of the necessity of the workmen retaining the services of others to assist them in getting their difficulties before us. (A very great many of the difficulties of the first six months of operation have by this course been overcome.)

As the workmen, the employers, and medical men become conversant with the Act and its limitations, then the load of the Board will be correspondingly reduced. Claimants are encouraged to present their complaints or their requests direct to the Board, and so far as we are aware no application for information or request for assistance has been denied.

We have been urging upon the employer the necessity of instructing his foreman or other proper heads of their different departments to get the employees to report any accident to him, no matter how trivial it may be, that may occur during the day; and, further, to make it imperative that the accident be reported on the day upon which it happens. One of the great difficulties with which we have been confronted is in the securing of reports of accidents promptly from the employers. Such delay imposes a great volume of unnecessary work on the staff of the Board in continually making requests for these reports. This is especially true in the case where employees are not familiar with the requirements of the law, and therefore fail to report accidents immediately to the employer; the employers quite frequently taking the position with the Board that inasmuch as the employee has failed to report the accident they have no knowledge of it. Oftentimes, too, where the injury in question is seemingly trivial, the employer thinks no more about it, and accordingly dismisses the incident from his mind until requested for a report from the Board some two or three weeks later. When such a request is received he feels that he has been imposed upon by both the workman and the Board.

Many injuries throughout the year appear at the time of their happening to be most trivial, but later on have developed into a serious condition, and in two cases have resulted in the death of the workman. It is therefore deemed imperative that every employer carefully record every injury reported, and that the workman report every injury and the manner in which it occurred, as well as the witnesses of the accident. When this practice is adopted many seeming difficulties will immediately disappear.

In case of an accident to a workman in an employment coming within the Act it is the duty of the employer within three days after its occurrence to report the same in writing to the Board. The failure of the employer to so report may subject him to a substantial penalty.

In every case of an injury to a workman by an accident in the industries within the Act it is the duty of that workman or, in the case of his death, the duty of the dependents, as soon as practicable after the happening of the accident, to give notice thereof to the employer. The notice is to be in writing, and should show the name and address of the workman and state in ordinary language the nature and cause of the injury, the time when and place where the accident occurred. This notice may be served upon the employer by leaving the same with him or his agents, or at his place of business where the accident occurred, or by sending it by registered mail addressed to him at his last-known residence or place of business. The failure of the workman to give notice of his accident, unless excused by the Board, may be a bar to his claim for compensation.

Forms supplied by the Board that are required to be filled out by the workman, the employer, and the doctor, where one has been in attendance, can be obtained from all Government Agents,

employers, and all physicians. Forms have also been supplied to the trades unions. When the proper claim forms have been completed in accordance with the requirements, the Board thereupon proceeds to deal with the claim and awards payment or takes such other action as may appear proper.

The Board desires to bear public testimony to the character of the services rendered by its various members of the staff. There was but one employee on the staff who had had previous experience in this class of work. The prescribed working-day seems to have been forgotten entirely, and the members of the staff voluntarily remained at work long after hours, or overtime at night, during Saturday half-holiday, and other holidays. There has been prevalent, also, a spirit of desire to understand the law and the practices of the Department in its various activities, so that there has developed a flexibility which enables a given member of the staff on short notice to undertake other than his or her usual work.

In the selection of the staff the Board exercised the greatest care, and were actuated only by the desire to secure the highest efficiency.

At the outset a study of conditions revealed the necessity of dividing the work and placing it under certain divisions having to do with assessments and audits, claims, medical, accident-prevention, and statistical.

(*b.*) A BRIEF OUTLINE OF WHAT LED UP TO WORKMEN'S COMPENSATION LEGISLATION.

A brief outline of what led up to workmen's compensation legislation might be interesting as a proper conception of the system that formerly prevailed, and is necessary to a thorough understanding of the theory of workmen's compensation. In discussing the subject this Board assumes that you are familiar with the principles applicable to those sustaining the relation to each other of employer and workman, and we will therefore make only such reference to common and statutory law on the subject of employers' liability as seems to be imperative.

The principle of systematic compensation for losses due to industrial accident has been known in Europe for over a century, the earliest examples being found in the mining industries. As these industries were the first to be operated on a large scale with large numbers of employees whose lives and safety depended on the care and skill of the manager and of the fellow-workmen, and in addition had a high danger rate, it was but natural that attempts should be made to provide in a definite manner for the relief of the distress of employees caused by accidental injuries or other physical disability. The European example has been followed by practically all the civilized nations of the world.

At the present time thirty-seven States, three Territories, and four Canadian Provinces have adopted various forms of "Workmen's Compensation Acts."

At the time of the adoption of the common-law rules of liability, industrial conditions radically differed from those which prevail to-day. The employer employed comparatively few workmen, with whom in the performance of their work he was brought into intimate association and was able to exercise a supervising care and control. He was acquainted with the habits and characteristics of each of his employees; the employees knew the employer personally in the same way, and, moreover, were brought into such close relationship with one another that their habits and peculiarities were mutually known and understood. The business carried on was small in extent; the appliances which were used in the work consisted in the main of hand-tools; the power, when any was used, was simple in character, afforded by the utilization of horses or of water-power applied directly to the machinery, which was neither complicated nor particularly dangerous in character. Under these conditions the rules of the common law originated.

The injured workman could recover from the employer only by showing that he was guilty of negligence; that is, that in the given case he has failed to exercise a proper degree of care and that the injury had resulted therefrom. From time to time in the development of the law qualifications to the liability of the employer for negligence were introduced. It was held that, notwithstanding the fault of the employer, if the employee himself had likewise been guilty of negligence contributing proximately to his injury he could not recover; that he assumed the natural and ordinary risks and perils incident to the performance of his services, and he was denied the right of recovery whenever the injury was occasioned by defects in appliances or premises with or upon which he worked with knowledge thereof, actual or imputed. It was

further held that where the injury was occasioned by the negligence of a fellow-servant he could not recover. These various substantive rules and defences were not unjust or unreasonable when applied to the conditions prevailing at the time of their adoption, but they have come to be recognized, not only in this country, but all over the civilized world, as no longer justly applicable to modern industrial conditions.

In the industries to-day, often thousands of men are employed in the service of a single employer; the appliances with which they do their work consist in the main of more or less complex machinery, kept in motion, and often in highly rapid motion, by the elemental forces of steam and electricity. This machinery so propelled is not always under the immediate control of the workman who uses it, but its operation is governed by other workmen at more or less remote points. These and other changed conditions have so impressed intelligent observers in this country that attempts have been made to modify the rules of the common law to meet them, and from time to time legislation has been adopted, sometimes abrogating an existing rule and sometimes altering it, in accordance with the opinions of the various legislative bodies which have dealt with the question. Thus the doctrine of contributory negligence has in some Provinces and States been so changed as to allow recovery where the negligence of the workman is slight as compared with that of the employer. The doctrine of assumption of risk has been so altered as to permit recovery where the defects, although known to the workman, consist in the absence of safety appliances, etc., prescribed by law. The doctrine of fellow-servant negligence has been modified by the introduction of the separate department and the superior-servant rule. Statutes have been passed imposing specific duties upon the employer having for their object the promotion of the safety of his workman and making him liable to workmen sustaining injury because of their non-performance. These attempts and others which might be enumerated all indicate a clear recognition on the part of Legislatures and Courts that the common-law system of employers' liability for negligence, with its various controlling defences, can no longer be justly applied to modern industrial conditions.

Not only has this been the case in our own country, but the same tendency is manifest in the legislation of nearly every civilized country in the world. Most of these countries have gone far beyond Canada and the United States in the direction of remedial legislation. England and her colonies and the various countries in Europe, with few exceptions, have adopted laws which either expressly or in effect abrogate the laws of liability for fault, and substitute the law of compensation under which the injured workman, or, in case of his death as the result of accident in the course of his employment, his dependents, receive certain definite compensation proportioned in various ways to the wages paid at the time of or during a prescribed period before the accident.

The general theory of workmen's compensation is that industry should bear the loss of life and limb incurred in the production of its finished product, just as it bears the expense of replacing worn-out and broken machinery; and that for every injury incurred in the course of employment some fixed amount should be provided in the way of compensation to the person incurring the injury, or to his dependents in case of his death; and this without regard to the question of fault or negligence of the employee, because many injuries or deaths are bound to occur under modern conditions, even when the utmost care is exercised by both the employer and the employee. The practical application of the doctrine involves a virtual abandonment of the common-law principles of employers' liability and the many statutory enactments commonly known as "Employers' Liability Acts," thus giving every employee injured in the course of employment the right to secure something in the way of compensation for his injury, and as soon as possible after he sustains his injury and at a minimum of expense.

The system as we now have it is better for the employee, because, while the amount of compensation is limited and fixed in amount, it is certain, and compensation is payable for every injury and for every death where persons are left wholly or partially dependent upon the deceased employee.

It is better for society at large, because under its operation a vast sum of money is saved that was expended under the old system in the way of law costs, Court costs, jury and witness fees, and for caring for those who had been incapacitated on account of injuries and as a result thereof become public charges.

The new plan is definitely superior to the old plan, in that under its operations the settlement of disputes growing out of personal injuries is taken entirely out of the realm of private

controversy. No longer is the employer arrayed against his injured or the dependents of his killed employees in legal combat, in which the employer is seeking to escape all liability and the employee or his dependents seeking the largest possible judgment that can be obtained, but the employer and his employees have a common interest in seeing that those entitled to compensation receive precisely the amount due them under the provisions of the law.

As our Act is drawn it gives the Board the monopoly of furnishing workmen's compensation insurance, whereas some other Acts permit insurance companies to engage in the so-called "business" of writing workmen's compensation insurance policies. The opinion is rapidly growing in effect that private interests should not be permitted to come between the employer and the injured employee and conduct a business for profit, which profit must come from the misery and distress of human beings. It is not a legitimate business, never has been, and can never be made such. It would not be considered a legitimate business proposition for private corporations to engage in the business of "policing" our cities and making prosecutions for the violation of laws. That is a matter that is very properly considered one of the functions of good government; so is the maintenance of a free public-school system, and we believe that the administration of the "Workmen's Compensation Act" by which the injuries of employees of our Province are cared for is as much a function of good government as the policing of our cities or the conduct of our free public schools. If, then, the administration of such a law is a function of good government, it cannot be considered a legitimate field for business. It has several times been urged by interested parties that there should be a competition in the business of furnishing workmen's compensation insurance and that the Province is not justified in creating a monopoly. The answer, however, is, as before stated, that it is not a "business" but a governmental function; and even granting it is a legitimate field for business, the Province has not made a business proposition of it. The Board is simply acting as the administering agent of a fund made up from contributions from all the employers of the Province; for the Board seeks to make no profit, but pays out of its treasury in the form of compensation every cent that is paid into the treasury by employers, less the cost of administration.

(*c.*) METHODS ADOPTED AND WORK PERFORMED BY THE SUBDIVISIONS OF THE ORGANIZATION.

(1.) ASSESSMENTS AND AUDITS.

The moneys from which compensation and administration expenses are paid is received from the employers by means of assessment upon their pay-roll. Basic rates are adopted in accordance with what is believed to be the hazard in the particular industry. Rates as adopted in this Province have been taken mainly from the experience of other Boards where like conditions obtain. As time goes on, however, our Statistical Department will furnish us with a basis upon which to settle the rates.

The Basic Rate and its Relation to Actual Cost.

The basic rate of assessment on pay-rolls for the different kinds of work is not to be regarded as indicating the true cost to the employers in the various industries. The cost in any year in each of the industries depends directly upon the amounts that have to be paid on account of the accidents which have occurred in each of the several classes, and, as nearly as can be estimated, depends upon the probable cost in each of the different kinds of work listed in each of the classes.

Fortunately it is provided in the Act that the assessment each year should be payable in instalments, as the needs of each class should require, and that so long as the funds to the credit of any class were sufficient no further instalment should be required, and that it might be deferred or altogether omitted.

By this means any efforts of employers which result in prevention of accidents result immediately and automatically in a lessening of the drain upon the funds of the class in which their industry is listed, and therefore makes it just so much the longer before it will be necessary to replenish the class fund by paying another instalment.

Each instalment is collected at the basic rate on only one quarter of the pay-roll, and when the proceeds are nearly exhausted, another instalment is collected on another quarter of the pay-roll. If only two instalments prove to be sufficient for the year, as was the case during

1917 in most of the classes, the other two instalments are omitted, thus making the true cost for the year in such classes only one-half of the basic rate, as that rate was collected on only two-quarters, or one-half, of the actual pay-roll. Where, for example, the basic rate, as in the case of sawmills, is 2.20 per cent., and but two calls each of a quarter of this rate was called, the effect was that the cost to the employer in that industry was but 1.10 per cent.

In only one class last year—namely, in Class 3, in which the operation of coal-mines was listed—was it necessary to collect all four instalments. The collection of the full basic rate from the employers in this class last year was directly attributable to the sad disaster at Fernie, in which thirty-four coal-miners lost their lives.

In Class 2, in which the lighter forms of manufacture of wood are listed, and in Class 9, which includes navigation, stevedoring, and wharf operation, it was necessary to collect three instalments, owing to serious accidents which occurred in the work of these classes. In most of the other classes two instalments were sufficient to pay the losses during the year and they have provided a satisfactory working balance, which has deferred the time when it will be necessary to require the first instalment for the present year.

Where two or more kinds of industry are listed in the same class, it is important that the basic rates on each kind of work should be in proportion to the probable hazard in the respective industry. So long as the basic rates for the different kinds of industry listed in any given class fairly correspond to the different probable hazard of the industries, the amount of the basic rate is not of especial importance to any employer, but the question that is of importance is on how many quarters of his pay-roll is the basic rate to be collected. That question, as already shown, depends directly on the care which is used to prevent accidents, and this in very large measure depends upon the employers themselves, who by using the greatest possible care to prevent accidents can very materially reduce the number of instalments that it will be necessary for them to pay in any year.

Every employer is required, when commencing business, to furnish to the Board an estimate of the probable amount of the pay-roll of each of his industries, together with any additional information that may be required. This estimated pay-roll is required by the Board to be sent in prior to the commencement of operation. Failure on the part of an employer to do this means that that employer is liable to a substantial penalty, as well as having charged up to him the full amount of the capitalized value of the compensation payable in respect of any accident to a workman in his employ which happens during the period of default.

In the event of an employer being in default of the payment of assessment, the Board has authority to issue a certificate stating that the assessment was made, the amount remaining unpaid on account of it, the person by whom it is payable, and such certificate, when filed with the District Registrar of the Supreme Court or with the Registrar of any County Court, becomes an order of that Court and may be enforced in the same manner as a judgment of the Court. This procedure, however, has been invoked in a very few cases.

For the purpose of pay-roll audits a number of field auditors have been appointed. These auditors call upon employers and inspect and audit their pay-rolls. It is the intention of the Board that the pay-roll of every employer is inspected and audited at least once a year.

It is requested that all the employers co-operate with the Board in obtaining from time to time the names of those firms or individuals commencing business and report them, because it means that the greater number of contributors in a class the less is the cost to the individual operator. We seek by means of our auditors and with the co-operation of those already in business to get the names of all new persons or firms starting business.

The total amount of assessments received from the industries on account of the 1917 assessment, together with the interest on the Board cash balances, amounts to $939,869.97. Compensation claims paid out for 1917 accidents amount to $358,227.37. There has been set aside for reserve to secure pensions the sum of $351,777.24. The balance is retained for the purpose of paying pensions to dependents whose claims have not yet been satisfactorily proved, and for the payment of permanent partial disability cases not yet surgically cured, etc. There has been collected for the Medical Aid Fund, wherewith to supply the medical-aid features of the Act, including interest on bank balances, the sum of $93,094.92, and there has been disbursed of this amount to physicians, hospitals, etc., the sum of $83,189.54. The cost of administration for the year 1917, which includes salaries, travelling expenses of the Board auditors, as well as the members of the Board, printing, supplies, postage, etc., investigation, accident-prevention, and

permanent equipment, was $57,830.07. Of this amount, $9,614.68 is for permanent equipment. The cost of administration, including permanent equipment, for 1917 is 5.977 per cent. Towards the administration expenses the Government of the Province paid the sum of $10,000, together with certain printing, supplies, and office space, so that the actual cost to the industries of administration, including permanent equipment, amounts to 4.943 per cent of the moneys collected from assessments.

Investments.

The Board has made the following investments to secure pensions: $25,000 Victory Loan bonds, bearing interest at 5½ per cent., for which was paid $24,776.99; $300,000 worth of British Columbia Provincial Government bonds, bearing 5 per cent. interest, for which was paid $261,842.05. This latter investment will net the Board 6⅛ per cent.

(2.) CLAIMS.

The first work performed by the Board was the organizing of the Claims Department, so that injured workmen would be in a position to receive their compensation with as little delay as possible. The equitable and prompt handling of claims is one of the most important functions of the Board, and to a very great extent the law itself, and its administration will be judged by the result in handling claims. The end to be obtained must be simplicity, promptness, accuracy, justice, and a broad interpretation of the Act. These requirements we have conscientiously endeavoured to carry out.

The educational campaign referred to in the early part of this report has done much towards assisting prompt adjustment of workmen's claims, and, in order to further assist, the Board has had placards placed in each industrial plant in the Province pointing out to the employee the necessary things to be done in order to secure prompt payment of compensation. The workmen were requested, in accordance with the Act's requirements, to forthwith notify their employers in writing immediately after the accident, no matter how trivial that accident might be, and in such notice to give the time, place, and nature of the injury. If the injury was sufficiently severe as to require medical attention, then the workmen are requested to see their physician immediately, and upon seeing him to see to it that that physician promptly sends in his report to the Board. The workman is not permitted to change physicians without first receiving the consent of the Board. It is also pointed out that the attending physician is required by law to assist the workman in completing his claim form and without charge to the workman, it being necessary on the part of the workman to carry out the physician's requirements.

Some considerable difficulty has been met with by reason of a general lack of understanding as to the limitations of the Act. Compensation can only be paid for cases of personal injury by accident arising out of and in the course of the workman's employment, together with certain industrial diseases as specified in the Act, or such other industrial diseases as the Board may add. The Board after very careful investigation and consideration have added to the industrial diseases already specified in the Act those of sulphur poisoning, trinitro-toluene poisoning, and cedar poisoning.

The workman is urged to sign his name plainly and clearly on all papers and to always sign it in the same way. In the event of any change in the address, to promptly notify the Board, because otherwise all communications would be addressed to him at the address given in his claim for compensation. If at any time information is required as to the interpretation of the Act or the position of the workman's claim, the Board is prepared to promptly and courteously answer same.

Scheme of Compensation.

Compensation is payable where in any industry within the scope of the Act personal injury by accident arising out of and in the course of employment is caused to a workman, and its being sufficient to disable the workman for a longer period than three days. The workman is entitled to medical treatment for all injuries so received, no matter how trivial.

If an injury is attributable solely to the serious and wilful misconduct of the workman, no compensation is payable unless the injury results in death or serious and permanent disablement. Certain industrial diseases specifically mentioned in the Schedule to the Act, as well as such

others as may be added by the Board, are treated as accidents and therefore compensable. The old defences of assumption of risk, negligence of fellow-workman, and contributory negligence on the part of the workman are no longer applicable.

The provisions of the Act respecting compensation are in lieu of all rights of action against an employer to which a workman or his dependents are entitled, either at common law or any Statute.

The compensation payable: (*a.*) In the case of total permanent disability is a periodical payment to the injured workman of 55 per cent. of his average earnings. The minimum shall not be less than $5 per week. (*b.*) In case of permanent partial disability the compensation is a periodical payment to the injured workman of 55 per cent. of his lost earnings. (*c.*) In case of facial disfigurement, impairment of earning capacity may be recognized, and a lump sum allowed in compensation. (*d.*) In the case of temporary total disability the compensation shall be that as outlined in (*a*). (*e.*) In the case of temporary partial disability the compensation shall be that as is outlined in (*b*).

The total number of accidents reported up to December 31st, 1917, were 12,684. Of this number, 217 resulted in death; 12,267 of these were adjusted or otherwise disposed of during the year. The balance of 1,417 are cases that came in during the month of December and where the reports were not all in or were being investigated prior to adjustment. There are always from 1,100 to 1,300 accident cases that cannot be adjusted until the reports are in or the necessary time elapses in which to entitle the workman to payment. The average number of accidents per month is 1,140. During the past six months this average has slightly increased, due to the fact that the workmen are becoming more conversant with the Act, and therefore are now making claims where in the past they said nothing.

During the past six months this Board has been adjusting claims where all information is in within seven days after the file is complete. This, we believe, is a record in prompt adjustment.

Where death results from the injury, the necessary expenses for the burial of the workman, not exceeding the sum of $75, is allowed. If the accident results in death and the workman leaves (*a*) a widow but no children, the widow is entitled during life or widowhood to a payment of $20 a month.

If the deceased workman leaves (*b*) a widow and children, the payment to the widow is $20 a month and $5 for each child under sixteen and each invalid child over that age, but not exceeding $40 in all.

If the deceased workman leaves (*c*) children only, the payment is $10 a month for each child under sixteen and each invalid over that age, but not to exceed $40 in all.

(*d.*) Where the dependents are parents, or other than the above mentioned, then a sum reasonably proportionate to the pecuniary loss of such dependents shall be paid, but not exceeding $20 per month to the parent or parents, and not exceeding on the whole $30 a month.

(*e.*) In any case covered by the above referred to (*a*) or (*c*), if the deceased workman leaves a parent or parents who are dependents, an award may be made to the parents in an amount not exceeding $20 per month, and not exceeding, with the compensation otherwise payable under the preceding paragraphs hereof, $40 per month.

Where a widow marries again the periodical payment ceases on her marriage, but she is entitled to a lump sum equal to the monthly payments for two years.

An important feature of the compensation under the Act is that it is payable periodically rather than in a lump sum, and as a rule continues during disability or during life, as the case may be.

Mr. Justice Meredith, in making his final report to the Ontario Legislature on the proposed "Ontario Workmen's Compensation Act," says as follows:—

"The relief should be as far as practicable by way of substitution for the wages of which the injured workman and his dependents are deprived by the injury. It should as a rule be periodical and not in a lump sum.

"The consensus of opinion amongst authorities on workmen's compensation is in favour of this principle. Wage-workers are, as a class, unaccustomed to the handling of large sums of money, and where compensation is paid in lump sums it is liable to be dissipated through extravagance or improvident investment. Experience in the United States and under the present English Act has shown also that where compensation is paid in lump sums a much larger proportion is consumed in legal expenses than would be under a system of periodical payments.

The prospect of a lump-sum payment as the probable result of an accident is also a larger inducement to self-inflicted injury than the periodical payment of a proportion of wages. Experience has, in fact, shown that most of the proven cases of self-injury have been occasioned by the need or desire for an immediate sum not available by way of wages. It has been urged also that the payment of the lump sum creates an inducement for the workman to live in idleness while his funds last instead of going back to work and earning what he can. Finally, except in the case of the death of an injured workman, it is impossible to estimate accurately the extent of the injury. The fixing of compensation by arbitrary assessment on the basis of an anticipated period of incapacity leaves room for the danger that the period has been underestimated, and the danger equally to be guarded against that it has been overestimated. Both these difficulties are obviated by a system of periodical payments. Even the English Act provides for periodical payments in certain cases. Where injuries result in disablement the compensation is in the form of weekly payments on the basis of half the impairment of the earning capacity. Provision is made, however, for the commutation of these weekly payments, and as a matter of fact they are in most cases commuted. This, of course, nullifies to a large extent the intention of the Act, but some provision for commutation is almost indispensable in an individual liability system, since the obligation of paying pensions for a period of years should create an intolerable burden for most employers and add to the insecurity of the workman. This latter feature was recognized in England by making provision for the purchase of Government annuities in commutation of periodical compensation payments, which provision in itself constitutes the embryo of a state-insurance system, and the inclusion of the principle of periodical payments even in its attenuated form in the English Act shows how far the English Act has departed from the 'wergeld' theory, under which the damages payable for injuries were regarded as commutation of the retribution which the injured person or his family was considered entitled to mete out to the injurer."

Where an impairment of earning capacity does not exceed 10 per cent. the Board may in its discretion fix the compensation in a lump sum. In the case of death or a permanent partial disability or permanent total disability, upon the application of the workman or his dependents, and at an agreed amount, the Board may fix a lump sum by way of compensation.

Compensation payments are not assignable, nor are they attachable. All questions as to the right for compensation, and the amount thereof, is determined by the Board instead of in the Courts. If any party feels aggrieved by reason of any award, the Board is always willing to reopen and hear any additional evidence that may be produced, so that in the end justice may be obtained.

The statement most generally used by the members of the Board in advising those affected is "that in so far as we are concerned a case is never closed." This course has met with universal approval and some have availed themselves of the opportunity so held out.

We have held many hearings, where the parties have had an opportunity of personally appearing before the Board. These hearings may be described as a people's court, in which every claimant is his own advocate. Cases of distress are frequently paid on the day of the hearing. Where claims are payable monthly and the injured workman's family is in distress, and it is brought to the attention of the Board, an advance is immediately made on account of compensation. This is considered a duty, although it involves much extra work.

(3.) MEDICAL DIVISION.

In order to make a success of the carrying-out of the terms of the Act it was essential to secure the hearty co-operation and patient service of the medical profession. The filling-out and the forwarding of reports under our Act is performed cheerfully by 95 per cent. of the physicians in accident cases, and the Board will do what it can to see that such physicians are paid reasonably for their work, not for making out the reports, but for the professional services rendered injured workmen. The attending physician is the eyes and ears of the Board, the expert on the ground, and the workmen must rely largely upon his knowledge and record of the cases for adequate compensation.

The Board early recognized the absolute necessity of a medical fee tariff, inasmuch as the different medical men placed a considerable difference in value on like services rendered. A tariff was finally agreed to on June 15th, 1917, and since that time very few difficulties have arisen in the adjustment of medical fees.

The medical men throughout the Province are required to furnish from time to time such reports of the injury as may be required by the Board regulations. They are also required to give all reasonable and necessary information, advice, and assistance to the injured workman and his dependents in making application for compensation and in furnishing in connection therewith such certificates and proofs as may be required by the Board without charge to the workman. All medical men, therefore, throughout the Province have been supplied with the necessary workman's claim forms.

The medical department branch deals with all medical, surgical, and hospital treatment, the supplying of transportation, nursing, medicines, crutches, and apparatus, including artificial members, as may be required by the injured workman. It will therefore be seen that this department deals with all medical men, druggists, dentists, all transportation concerns of every nature and kind, artificial-limb houses, etc.

In the event of a workman being injured the first effort made is to get him to the nearest place where medical treatment can be given, and the result is that every sort of conveyance is brought into action. Some of those who supply these conveyances and other Board requirements are inclined to be reasonable, whereas others are extremely unreasonable. The Board is generally looked upon as a Government institution and that they should therefore compensate in a larger amount than would be compensated by an ordinary individual. It is at times extremely hard in the settlement of transportation and other charges to arrive at a fair basis of payment.

A workman is entitled under this Act to the very best treatment available. He is entitled to just as good medical and hospital treatment as can be supplied to the richest man in the land. It is necessary, immediately a workman is injured, that he obtain medical assistance if the same is at all available, and either the Board or a medical plan approved by the Board pays for that treatment.

There are two means by which the medical aid referred to in the Act may be provided—namely, by the workman coming directly under the Board, in which case the sum of 1 cent per day or part of day is retained from the wages of the workman. In the case of such contribution the workman is entitled to all medical, surgical, and hospital treatment referred to heretofore, and in addition has the right to select his own physician, the discretion of the selecting of a physician being entirely vested in the workman.

The other method is by means of an approved plan. Any plan which provides for medical aid to the workman, and which is in the opinion of the Board found on the whole to be not less efficient in the interest of both the employer and the general body of workmen than the provision for medical aid heretofore referred to, may be approved by the Board. This plan must be sufficient in itself to provide all those things which the Board would had they the direct handling of it.

It has been the practice of the Board to not approve any plan where there are a number of physicians available. To do otherwise would mean the interference with the selective right of a physician by the workman.

During the year this Department has in all cases insisted on the strict carrying-out of the "Ambulance Act." This Act provides that every employer of labour directly or indirectly operating any mine, camp, or construction-work or industries employing more than thirty persons, and being located more than six miles from the office of a medical practitioner, is at all times required to maintain in or about such industry or work at least one person possessing a certificate of competency to render first aid to the injured. The industry is also required to supply a good and sufficient ambulance box or boxes. The carrying-out of such an Act means that the different industries now have on their place a first-aid man, together with a first-aid kit.

Back Injuries.

These have a bad reputation. The workman quite properly looks at them with apprehension. Under conditions prior to the coming into effect of this Act, the employers and insurance companies looked upon this class of injury with doubt, the medical practitioner with suspicion, the lawyer with uncertainty, and the Court with as open a mind as possible under the circumstances. This class of case creates one of our chief difficulties. The workman is depressed by the fear of permanent disablement, the slow process of his illness, and the natural effects through enforced idleness. Many surgeons of the very best standing state that a good many alleged sprained-back

conditions are undoubtedly due to rheumatism. From a perusal of the reports of other Boards it would appear that they have had a similar experience.

The Board is puzzled by conflicting and often contradictory reports of the surgeons and suffer from lack of authoritative opinion in medical literature. It is only by a most careful examination of the evidence in the file of each particular case that one is able to give even an approximate opinion as to whether or not the workman is suffering personal injury by accident.

Hernias.

These present another difficulty of real magnitude. Eminent medical authorities seem to agree that hernia may, though very rarely, be due to a sudden strain. Our Board compensates for hernias where it can be shown that the same were caused by accident.

(4.) Accident-prevention.

The primary purpose of workmen's compensation legislation should be to prevent injuries to workmen. All realize that no sum of money can compensate a widow and orphans for the loss of a husband and father. It is therefore much better to prevent accidents, retaining the earning power of the workman, than to have the accident occur and also loss of earning power ensue with the resulting loss to the community. Compensation is at the best a poor exchange for the loss of a limb, and the mere monetary award can never compensate a workman for a lifelong disability. Accident-prevention is therefore as desirable from an economic view-point as from the humanitarian side.

To evolve a proper accident-prevention organization it has been the experience of other Boards that statistics should first be obtained before definitely settling on accident-prevention plans. This Board, shortly after the starting of its operations, arranged by means of the different Government Inspectors under the "Factories Act," the "Boilers Inspection Act," and the "Mineral Act" to get a report from them on all accidents happening within their jurisdiction.

By reason of the workmen being the ones most interested in accident-prevention, and being on the spot where the work in question is being done, and also realizing in many cases what is the best thing to do to prevent accidents in their particular place of employment, we have from time to time urged upon them to write us confidentially, making suggestions as to how best to improve their condition, as well as to protect against injuries to their fellow-workmen. In order to further encourage suggestions from injured workmen as to the best course to be adopted to prevent against accidents of the nature of which befell him, a question was placed on his claim form in these words: "Suggest anything you can to prevent such accident"—at the same time advising the workman that his suggestion would be treated as absolutely confidential and thereby assuring him that there would be no possible means by which his suggestion could reach the knowledge of his employer. The reason for such a course is quite obvious. Many valuable suggestions have been made by workmen, and in the case of every suggestion the same has been carefully inquired into and in many cases adopted. The different Government departments authorized their Inspectors to receive instructions from the Board, and in every single case where a request has been made for a particular inspection the same has been made and a report made thereon to the Board. In addition to that, the different Inspectors in reporting an accident to their departments send a duplicate of that report to this Board. By reason of the activity of the Board in this behalf many hundred more inspections have been made this year than hitherto, and it is generally conceded throughout the Province that by reason thereof very many accident-prevention measures have been adopted. This is but the start.

Rules for accident-prevention have been drafted by the Board for submission to public hearings which will shortly be held in accordance with the requirements of the Act.

It is provided by the Act that the employers in each class of industry must take care of and pay for their own accidents. Therefore there should be a strong incentive on the employers' part to reduce the number of accidents to the minmum as an economic consideration in addition to the humanitarian phase. In a large number of industries it is impossible to put the workman in the same condition as he was before the accident, provided he suffered a permanent loss, and which is also a permanent loss to the community. On the other hand, if the employers by safety regulations or safety methods can reduce the number of accidents, they thereby reduce the cost of the operation of this law to them. Some of the employers in the Province have their plants well safeguarded and also have their employees organized along safety lines. In the last six months of this year considerable work along these lines has been perfected.

It has also developed another peculiar phase of the situation. An employer who has adopted safety measures is active in seeing that other employers in his class do likewise, and therefore it quite frequently happens that an employer takes up with other employers in his class the advisability of installing certain safety devices, and in some cases have reported to our Board the failure of some other employer in his class as not being active in that regard; in other words, we find an active co-operation on the part of the employers in the majority of classes towards adopting the most recent safety apparatus and devices.

(5.) STATISTICAL DEPARTMENT.

Statistics are simply a collection of facts so selected and arranged as to bring out the bearing of experience upon a particular problem. For the better administration of workmen's compensation laws it is therefore necessary to have an accurate statistical record of all accidents, their nature and their disposal.

The Board started in August last and hopes to maintain a small but well-organized Statistical Department which will analyse claims to discover causes of accidents, and thereby present an opportunity of adopting safety measures which will prevent the reoccurrence of such accidents. It would also further present an opportunity of promulgating information thereon, thereby offering a constant incentive to both the employees and employers to adopt safety measures and devices. The information in the hands of the employers should fully develop the theory that it is better to prevent accidents than to compensate the losses arising therefrom. It is also necessary to have such a Department for the purpose of the settlement of rates. This Department will tabulate and promulgate information as to the relative cause of the different classes of injury and thus keep the employees, the employers, and the public generally informed of the average cause and aggregate cost of industrial accidents.

To serve these ends accident statistics must be analysed by industries, by cause of accident, and by nature and location of injury and extent of disability, and must be so cross-analysed as to show the correlation of each of these sets of facts with every other. It is important to know the number, ages, and relationship of dependents in fatal cases and the age and wage groups of the injured in all cases. It goes without saying, also, that the pay-roll exposure should be obtained from industries and the wage loss and amount of compensation and of medical aid should be shown by industries by cause of accident and by nature and location of injury and extent of disability.

It will necessarily take some little time before this Department will be of much use, inasmuch as it is necessary for time to elapse to get the information.

Merit Rating.

In order to introduce the merit-rating system contemplated by the Act, a complete record of the accidents happening in each employer's plant is being carefully kept. Rates may then be equitably adjusted to the particular conditions of individual plants. This plan is designated to enable employers who have reduced the hazards in their plants by the installation of safety devices and by measures for accident-prevention to secure a proportionate reduction on rates through merit credits, and on the other hand penalize employers who neglect safety equipment in their plants and tolerate conditions dangerous to life and limb of their employees by imposing a demerit differential in addition to the regular rate.

Grouping of Employers.

The Act further empowers the Board to rearrange any of the groups and to set up new groups at its discretion. Acting under such authority the Board has created four new groups. These are known as Class 13, the Provincial Government employees; Class 14, municipalities; Class 15, canning and fishing; and Class 16, explosives.

ACCIDENT STATISTICS.

Tables Nos. 1 to 7 deal with the accident statistics for the year 1917, these being obtained from the finalled non-permanent total disability claims on which time awards were paid.

Owing to the time taken up in organization-work it was found impossible to commence the gathering of these statistics until the fall of the year. It is obvious that only claims which have been finally disposed of can be used for statistical purposes.

Table No. 1 shows the above accidents tabulated according to their respective classes of industries. The number of accidents in each sub-class is shown, together with the time awards paid. It will be seen that the total number of finalled non-permanent total disability claims during the year was 5,483, involving time awards of $209,828.83.

In Table No. 2 the duration of disability is shown, the accidents being arranged according to class of industry.

Table No. 3 shows the nationality of the injured workmen, arranged according to their class of industry. It will be seen that 2,700 come under the heading of "British," this being almost 50 per cent. of the total. Canada follows with 732, and the United States with 380.

Tables Nos. 4 and 5.—In these tables are shown the causes of the accidents; one table showing the mechanical and the other the non-mechanical cases. The injuries from mechanical causes are 26.17 per cent. of the total number, and the compensation paid on same is 27.24 per cent. of the total, with reference to these finalled cases.

Table No. 6 is self-explanatory, showing as it does the average wage of all the workmen involved in these claims, also the average wage of the English-speaking and other races.

Table No. 7 gives the nature of the injuries received, and the time lost in connection with same. The average duration of disability per accident of each kind is also given.

LIST OF CLASSES.

The following is a list of the classes, with the nature of the industries in each class, for the year 1917:—

CLASS 1.

1. Creosoting-works.
2. Lath-mills.
3. Logging, including cutting, river-driving, rafting, booming.
4. Pulp and paper manufacturing.
5. Sawmills.
6. Shingle-mills.
7. Spokes, staves, and heads manufacturing.
8. Travelling wood-saw.

CLASS 2.

1. Artificial limbs.
2. Barrel-manufacturing, including stave-manufacturing.
4. Brooms and mops manufacturing.
5. Carpentering; shop only.
6. Coffins, manufacturing.
7. Cooperage; no stave-manufacturing.
8. Excelsior and veneer manufacturing.
9. Furniture, manufacture of.
11. Pails and tubs, manufacture of.
12. Picture-framing.
13. Planing-mills.
14. Sash and door factories.
15. Trunks, manufacture of.
16. Vehicles, manufacture of.
17. Wooden boxes, manufacture of.
18. Wood-working plants.

CLASS 3.

1. Coal-mining.
2. Shaft-sinking only.

CLASS 4.

1. Artificial stone and cement blocks.
2. Cement, manufacture of; no quarry.
3. Cement, manufacture of; with quarry.
4. Clay, gravel, sand, or shale pits.
5. Clay, gravel, sand, or shale pits; hydraulic only.

6. Concentration of ores by water.
7. Earthenware, bricks, roof-tiles, terra-cotta, or sewer-pipes.
8. Gypsum-quarry.
9. Gypsum, manufacture of; no quarry.
10. Lime-kilns; no quarry.
11. Metal-mining.
12. Monuments, lettering and setting.
13. Quarrying.
14. Stone-crushing.
15. Stone cutting or dressing.
16. Smelting or reduction of ores.

CLASS 5.

1. Auto-repairing.
2. Iron beds, manufacture of.
3. Blacksmiths' shops.
4. Bolts, nuts, nails, spikes, manufacture of; cold process.
5. Bolts, nuts, nails, spikes, manufacture of; hot process.
6. Cans, manufacture of; no hand-feed stamping.
7. Cans, manufacture of; hand-feed stamping.
8. Engines and boilers, manufacture of.
9. Foundries, iron, steel, or brass.
10. Furnaces and stoves, manufacture and installation of.
11. Machine-shops.
12. Metal, steel, or iron products, manufacture of; not elsewhere stated.
13. Metalware, small, manufacture of.
14. Ornamental-iron works; shop only.
15. Rolling-mills.
16. Sheet-metal works; shop only.
17. Structural steel, fabrication.
18. Welding; shop only.

CLASS 6.

1. Awnings, tents, and sails, manufacture of.
2. Bakers and confectionery; no delivery.
3. Bakers and confectionery manufacture; with delivery.
4. Beverages and liquors, manufacture of, including bottling and delivery.
5. Butchers, retail.
6. Canning and packing fish.
7. Canning and packing fruit and vegetables.
8. Carting and teaming, warehousing and storage.
9. Chemicals and compounds, manufacture of; not elsewhere stated.
10. Cigars, manufacture of.
11. Cleaning and dyeing.
12. Cloth, clothing, and textiles, manufacture of.
13. Coal and wood yard; operation of.
14. Cold-storage plants; no teaming.
15. Cold-storage plants; with teaming.
16. Creameries, including delivery.
17. Drugs, manufacture of.
18. Elevators, operation of.
19. Explosives, manufacture of.
20. Fertilizer, manufacture of.
21. Flour-milling.
22. Food products, manufacture of; not elsewhere stated.
23. Grain, handling of.
24. Glass, bevelling, leaded, or silver-plated works.
25. Glass, manufacture of or repair of.
26. Ice, manufacture of, including delivery.

27. Janitors.
28. Jewellery, manufacture of.
29. Knitting-mills.
30. Hand-laundries.
31. Power-laundries.
32. Leather tanneries.
33. Leather shoes, manufacture or repair of.
34. Leather goods, manufacture of; not elsewhere stated.
35. Oyster-cultivation.
36. Oil, refining and distribution of.
37. Packing-houses; with slaughtering.
38. Packing-houses; no slaughtering.
39. Paints, manufacture of.
40. Paper, tarred, pitched, or asphalted, manufacture of.
41. Printing, engraving, or lithographing.
42. Rubber or rubber goods, manufacture of.
43. Stationery, manufacture of.
44. Upholstering.
45. Wholesalers; with teaming.

Class 7.

1. Acetylene welding; away from shop.
1a. Erection of awnings by manufacturer.
1b. Boats and small launches.
2. Bridge-building, steel.
3. Bridge-building, wood.
4. Buildings, construction of; not elsewhere stated.
5. Carpentry, structural.
6. Dams, flumes, or reservoirs, construction of; with blasting.
7. Dams, flumes, or reservoirs, construction of; no blasting.
8. Dredging.
9. Dry-docks, construction of.
10. Electric wiring of buildings.
11. Fishing.
12. Floor-laying.
13.
14. Heating and plumbing.
15. House moving and wrecking.
16. Installation of boilers, engines, marine elevators, iron stairs, or ornamental-iron work.
17. Installation of elevators.
18. Irrigation-works, construction of.
19. Lathing.
20. Marine railways, operation of, including repair of ships.
21. Mason-work.
22. Painting.
23. Painting high buildings.
24. Parkmen.
25. Pier-construction.
26. Pile-driving.
27. Plastering.
28. Reinforced-concrete construction.
29. Road-making; with blasting.
30. Road-making; no blasting.
31. Roofing.
32. Scavenging or street-cleaning.
33.
34. Sewers, operation and maintenance of.
35. Sewers, construction or extension of.

36. Sheet-metal erections.
37. Steel-frame erection.
38. Steel-ship building; shop only.
39. Steel-ship building; away from shop.
39A. Street-paving.
40. Subaqueous construction.
41. Tunnelling or well-digging.
42. Waterworks, construction of plant.
43. Waterworks, construction of stand-pipes or water-towers.
44. Waterworks, maintenance, including new connections.
45. Well-drilling.
46. Window-cleaning.
47. Wooden-ship building; shop only.
48. Wooden-ship building; away from shop.

CLASS 8.

1. Auto transportation; country stage.
2. Electric light and power plants, lines and appliances, construction of.
3. Electric railways, construction of.
4. Electric railways, operation and maintenance of.
5. Fire departments.
6. Gasworks, construction of, and extension of existing plants.
6A. Gasworks, operation of.
7. Logging-railways, construction, maintenance, or operation of.
8. Motion-picture machines, operation of.
9. Police departments.
10. Railway express delivery.
11. Steam-railways, construction or operation of.
12. Telegraph and telephone systems, construction of, including line-work.
13. Telegraph and telephone systems, operation of.
14. Theatre stage; operation only.

CLASS 9.

1. Navigation.
2. Stevedoring.
3. Operation of wharves.

CLASS 10.

1. Canadian Pacific Railway Company.
2. Canadian Pacific Ocean Services, Limited.
3. Consolidated Mining & Smelting Company of Canada, Limited.
4. Dominion Express Company.
5. Esquimalt & Nanaimo Railway Company.
6. Kettle Valley Railway Company.
7. West Kootenay Power & Light Company, Limited.

CLASS 11.

1. Canadian Express Company.
2. The Grand Trunk Pacific Coast Steamship Company, Limited.
3. The Grand Trunk Pacific Development Company, Limited.
4. Grand Trunk Pacific Railway Company.
5. Grand Trunk Pacific Telegraph Company.

CLASS 12.

1. Canadian Northern Pacific Railway Company.
2. Canadian Northern Express Company.
3. Great North Western Telegraph Company of Canada.

FATALS, 1917.

The number of fatal cases reported was 217, and up to December 31st reserves had been set aside in eighty-four of these cases to the amount of $306,161.75.

Coal-mining Industry.

The number of fatalities from mine-explosion alone was thirty-eight, of which thirty-four occurred on April 5th at the mine of the Crow's Nest Pass Company at Fernie. In connection with this disaster twenty-five cases involved payment of pensions and have been disposed of, the reserves on same amounting to $99,594.46. The remaining four mine-explosion fatals occurred at the mine of the Canadian Collieries (Dunsmuir), Limited, at Cumberland, and in three of these cases reserves have been set aside to the extent of $11,589.51.

There were six other fatal cases attributable to the coal-mining industry. Four of these were caused by falling coal, one by derailment of coal-cars, and in the remaining case the workman (a Japanese) was electrocuted.

Metal-mining.

There were nineteen cases in this class. Five were caused by explosions of powder, five by fall of rock, etc., and three by falling from a height.

Logging Industry.

The logging industry was responsible for forty-three fatals, but up to the end of the year only eight dependents' claims had been disposed of, with reserves totalling $29,605.05. The causes of the accidents in this class are as follows:—

Rolling or falling logs	9
Cable or hoisting apparatus	9
Falling trees	12
Locomotive or donkey-engine	3
Drowned by slipping from logs	3
Suffocation by forest fire	2
Collapse of bridge	1
Other causes	4

Sawmills and Shingle-mills.

There were eighteen fatal accidents in this class, the causes being shown in the following table:—

Power-saw accidents	2
Struck by log-carriage	1
Shafting	2
Rolling or moving logs or lumber	5
Cables or chains	2
Falls, burns, etc.	6

STATISTICAL TABLES.

Table No. 1.—Non-permanent Total Disability Claims finalled during 1917, showing the Number of Accidents in each Class and Sub-class, with the Amount of Time Awards.

Class and Sub-class.	Number of Accidents.	Total in Class.	Amount of Compensation paid.	Total Compensation paid in each Class.
1— 1	2		$ 5 32	
1— 3	530		31,516 55	
1— 4	139		6,516 37	
1— 5	511		15,345 18	
1— 6	190		7,873 06	
1— 7	7		114 07	
		1,379		$61,370 55
2— 1	1		$ 38 57	
2— 4	1		39 15	
2— 5	1		75 24	
2— 8	7		182 76	
2— 9	15		289 65	
2—13	61		1,765 77	
2—14	8		144 44	
2—17	46		993 10	
2—18	5		81 89	
		145		3,610 57
3— 1	677		$ 29,747 90	
		677		29,747 90

STATISTICAL TABLES—*Continued.*

TABLE No. 1.—NON-PERMANENT TOTAL DISABILITY CLAIMS FINALLED DURING 1917—*Continued.*

Class and Sub-class.	Number of Accidents.	Total in Class.	Amount of Compensation paid.	Total Compensation paid in each Class.
4— 4	1		$ 2 75	
4— 6	2		1,023 10	
4— 7	4		75 47	
4—10	1		35 20	
4—11	393		20,195 18	
4—12	1		42 35	
4—13	14		568 33	
4—14	1		11 55	
4—16	65		2,893 21	
		482		$24,847 14
5— 1	24		$ 732 84	
5— 2	3		41 48	
5— 3	2		11 14	
5— 4	3		34 45	
5— 5	1		47 85	
5— 7	45		590 48	
5— 8	13		243 16	
5— 9	42		2,259 04	
5—10	1		10 50	
5—11	147		4,215 24	
5—12	16		464 88	
5—15	3		48 20	
5—16	1		2 50	
5—17	4		41 09	
5—18	1		19 80	
		306		8,762 65
6— 1	1		$ 14 85	
6— 2	1		38 95	
6— 3	14		225 27	
6— 4	12		247 82	
6— 5	13		178 64	
6— 6	57		2,046 97	
6— 7	24		380 66	
6— 8	46		1,751 67	
6— 9	10		147 33	
6—12	6		38 96	
6—13	23		417 36	
6—14	1		3 03	
6—15	5		204 91	
6—16	16		385 05	
6—18	3		285 31	
6—19	22		875 99	
6—20	9		261 38	
6—21	5		84 81	
6—22	15		345 19	
6—23	2		23 65	
6—25	1		2 75	
6—26	2		29 89	
6—27	2		42 17	
6—30	1		7 65	
6—31	13		374 11	
6—33	2		26 98	
6—36	12		590 71	
6—37	12		222 11	
6—38	8		257 22	
6—39	3		26 97	
6—40	1		31 76	
6—41	12		274 12	
6—43	5		48 10	
6—45	21		304 78	
		380		10,197 12

STATISTICAL TABLES—*Continued.*

TABLE NO. 1.—NON-PERMANENT TOTAL DISABILITY CLAIMS FINALLED DURING 1917—*Continued.*

Class and Sub-class.	Number of Accidents.	Total in Class.	Amount of Compensation paid.	Total Compensation paid in each Class.
7— 1B	1		$ 11 00	
7— 3	2		24 54	
7— 4	108		4,527 98	
7— 5	8		222 90	
7— 6	4		184 08	
7— 7	1		32 18	
7— 8	26		677 50	
7—10	4		191 64	
7—11	17		1,280 34	
7—14	8		367 03	
7—15	1		23 93	
7—16	6		349 37	
7—17	2		35 09	
7—20	7		264 50	
7—21	14		587 52	
7—22	6		152 83	
7—24	3		65 53	
7—25	19		470 38	
7—26	17		725 00	
7—27	3		59 54	
7—28	38		761 32	
7—29	1		4 95	
7—30	5		140 33	
7—32	10		163 17	
7—34	1		6 60	
7—35	7		69 86	
7—36	3		238 98	
7—37	6		164 72	
7—38	49		1,333 75	
7—39	185		4,495 46	
7—39A	6		202 89	
7—41	7		292 01	
7—42	6		125 76	
7—43	2		127 02	
7—44	3		69 72	
7—45	1		101 48	
7—46	1		20 63	
7—47	21		937 23	
7—48	262		7,333 49	
		871		$26,842 25
8— 2	11		$ 234 82	
8— 3	1		121 36	
8— 4	54		1,244 65	
8— 5	26		626 52	
8— 6	6		98 26	
8— 7	59		3,700 63	
8— 8	3		37 12	
8— 9	9		1,307 99	
8—11	61		1,646 58	
8—12	2		65 61	
		232		9,083 54
9— 1	46		$ 1,707 94	
9— 2	239		9,220 57	
9— 3	29		674 11	
		314		11,602 62
10— 1	188		$ 6,559 20	
10— 2	21		872 82	
10— 3	372		13,003 45	
10— 4	9		184 12	
10— 5	16		309 02	
10— 6	26		566 31	
10— 7	1		8 66	
		633		21,503 58

STATISTICAL TABLES—*Continued.*

TABLE No. 1.—NON-PERMANENT TOTAL DISABILITY CLAIMS FINALLED DURING 1917—*Concluded.*

Class and Sub-class.	Number of Accidents.	Total in Class.	Amount of Compensation paid.	Total Compensation paid in each Class.
11— 2	1		$ 3 30	
11— 3	1		30 61	
11— 4	11		379 83	
		13		$ 413 74
12— 1	51		$ 1,847 17	
		51		1,847 17
Totals	5,483		$209,828 83	

TABLE No. 2.—DURATION OF DISABILITY OF NON-PERMANENT TOTAL DISABILITY CASES FINALLED DURING 1917.

Duration of Disability.	Class.												Totals.
	1	2	3	4	5	6	7	8	9	10	11	12	
Not more than 6 days	88	5	40	59	31	49	102	30	27	86	3	7	527
From 6 to 12 days	375	37	166	119	96	105	277	54	79	170	3	14	1,495
„ 12 to 18 „	200	25	139	93	63	80	162	50	53	139	2	7	1,013
„ 18 to 24 „	171	21	92	63	35	35	106	28	48	79	2	6	686
„ 24 to 30 „	144	22	61	39	29	29	60	15	28	43	..	4	474
„ 30 to 36 „	90	9	38	22	8	24	44	15	19	30	..	2	301
„ 36 to 42 „	76	6	30	22	15	11	22	16	12	19	1	4	234
„ 42 to 48 „	41	4	25	15	10	8	26	5	10	14	..	..	158
„ 48 to 54 „	34	4	18	9	5	10	16	6	7	15	..	..	124
„ 54 to 60 „	19	1	6	8	4	10	9	2	10	7	1	1	78
„ 60 to 66 „	28	6	13	5	3	5	6	1	5	3	..	2	77
„ 66 to 72 „	24	1	8	4	3	3	6	1	4	4	..	1	59
„ 72 to 78 „	14	..	3	4	..	2	7	2	3	2	..	..	37
„ 78 to 84 „	15	1	8	2	2	1	3	..	..	7	1	..	40
„ 84 to 90 „	6	..	3	3	..	..	2	..	..	2	..	..	16
„ 90 to 96 „	10	1	5	..	1	..	3	1	..	4	..	1	26
„ 96 to 102 „	5	..	2	4	..	..	3	..	4	1	..	..	19
„ 102 to 108 „	6	..	1	..	..	..	1	1	..	3	..	..	12
„ 108 to 114 „	5	..	2	1	..	1	2	..	..	..	..	..	11
„ 114 to 120 „	3	1	1	1	..	1	1	2	1	..	..	..	11
„ 120 to 126 „	3	..	2	1	..	1	4	..	..	1	..	1	13
„ 126 to 132 „	2	1	2	..	..	..	2	1	..	..	..	..	8
„ 132 to 138 „	5	..	..	1	..	..	2	..	1	1	..	..	10
„ 138 to 144 „	2	..	1	1	..	1	1	..	..	1	..	..	7
„ 144 to 150 „	2	..	..	1	..	..	1	..	..	..	..	..	4
„ 150 to 156 „	2	..	..	1	..	..	..	..	..	..	..	..	3
From 156 days to 7 months	8	..	9	1	..	3	3	1	3	1	..	1	30
From 7 months to 8 months	..	..	2	1	1	1	..	..	..	1	..	..	6
Over 8 months	1	..	..	2	..	..	..	1	..	..	..	..	4
Totals	1,379	145	677	482	306	380	871	232	314	633	13	51	5,483

STATISTICAL TABLES—*Continued.*

TABLE No. 3.—NATIONALITY TABLE, NON-PERMANENT TOTAL DISABILITY CASES.

Nationality.	Class.												Totals.
	1	2	3	4	5	6	7	8	9	10	11	12	
Canadian	180	18	53	60	55	60	134	38	36	85	4	9	732
British	400	71	381	171	208	235	577	125	220	281	3	28	2,700
United States	153	9	14	41	22	22	45	26	8	34	2	4	380
Italian	46	1	72	43	4	16	35	13	17	126	..	3	376
Swedish	40	1	3	42	4	2	11	3	2	10	..	2	120
Norwegian	25	2	..	14	2	1	15	3	6	4	1	..	73
Danish	4	..	..	3	2	2	6	..	1	..	..	..	18
Chinese	209	22	37	3	..	14	2	7	..	9	..	..	303
Japanese	162	13	14	18	1	9	7	1	6	3	1	1	236
Austrian	20	..	45	20	1	..	3	1	..	45	1	2	138
Spanish	1	..	..	7	..	..	2	1	..	..	..	..	11
French	2	..	4	3	..	..	1	1	1	..	..	..	12
Belgian	5	..	4	..	1	1	..	1	1	..	..	..	13
Russian	58	3	26	25	2	..	10	4	6	14	..	..	148
Dutch	..	..	2	1	..	1	..	..	1	2	..	..	7
Greek	4	..	7	2	1	..	4	1	3	9	..	..	31
Montenegrin	..	..	1	5	..	1	..	1	..	..	..	..	8
Serbian	1	..	3	19	..	1	2	..	..	4	..	..	30
Mexican	..	..	..	..	..	..	..	..	1	..	..	..	1
Portuguese	..	..	..	..	..	..	..	..	..	..	..	..	
Bulgarian	..	..	..	..	..	..	..	..	..	..	..	..	
Native of India	38	2	..	..	..	..	2	1	..	..	..	..	43
Native Indian	9	..	1	1	..	2	1	..	..	..	1	..	15
Roumanian	..	..	2	..	..	1	1	1	1	..	..	..	6
Swiss	..	..	3	..	..	1	..	..	..	..	..	..	4
German	3	..	1	1	..	..	2	..	..	1	..	..	8
Macedonian	..	..	..	..	..	1	..	..	..	..	..	..	1
Chilian	..	..	..	..	..	..	2	..	1	..	..	..	3
Not stated	19	3	4	3	3	10	9	4	3	6	..	2	66
Totals	1,379	145	677	482	306	380	871	232	314	633	13	51	5,483

TABLE No. 4.—MECHANICAL INJURIES FOR THE YEAR 1917, NON-PERMANENT TOTAL DISABILITY CASES FINALLED DURING THE YEAR.

Agency.	No. of Accidents.	Compensation paid.
Motor-engines, dynamos, etc.	8	$ 436 34
Air-fans, steam-pumps, etc.	3	99 88
Gearing, cogs, etc.	42	2,521 25
Set-screws	9	770 63
Shafting	10	242 00
Belts and pulleys	34	1,592 37
Cables	35	3,394 56
Conveying and hoisting machinery	183	7,677 96
Elevators	14	631 26
Cranes and derricks	64	1,922 67
Slab and spelt conveyors	1	6 47
Railway and rolling-stock	20	936 11
Coupling cars	49	1,764 64
Falls from trains	52	2,207 40
Struck by trains	7	327 08
Collision and derailment	27	1,505 14
Hand-cars, push-cars, speeders, etc.	15	408 37
Coal-cars, dump-cars, trailers	181	7,672 55
Other railway causes	33	1,164 72
Hand-brakes	4	101 06

STATISTICAL TABLES—*Continued.*

TABLE NO. 4.—MECHANICAL INJURIES FOR THE YEAR 1917—*Concluded.*

Agency.	No. of Accidents.	Compensation paid.
Saws (power-driven)	217	$ 9,758 51
Planers	48	1,418 96
Jointers	6	339 79
Lathes	33	646 91
Log-carriages	14	441 93
Live rolls, cables, etc.	25	547 96
Cooperage machinery	1	11 00
Other wood-working machines	13	283 01
Paper-making machinery	14	432 53
Printing-presses, etc.	9	181 51
Laundry machinery	3	55 98
Textile machinery	1	3 75
Automobiles, motor-cycles	45	1,482 70
Drilling and milling machines	74	2,559 79
Drop and other power hammers	17	476 44
Cement-mixers	2	16 00
Contact with grindstones, etc.	8	186 32
Struck by fragments of polishing-wheels, etc.	13	64 75
Baking machinery	4	293 50
Machines (not elsewhere stated)	61	1,931 50
Shipyard machinery (not elsewhere stated)	14	337 57
Can-making machinery, hand-feed	22	306 24
Totals	1,435	$57,159 11

TABLE NO. 5.—NON-MECHANICAL INJURIES FOR THE YEAR 1917, NON-PERMANENT TOTAL DISABILITY CASES FINALLED DURING THE YEAR.

Agency.	No. of Accidents.	Compensation paid. Time Awards.
Explosives	9	$ 347 88
Explosion of gas, dust, etc.	16	464 78
Escaping steam, etc.	14	578 85
Other injuries, steam, etc.	17	374 29
Caustics	21	614 05
Explosions, molten metals	14	1,518 44
Other accidents, molten metals	27	1,284 76
Vats, etc.; not liquids, etc.	17	525 24
Electricity	22	1,235 31
Fire and heat (not elsewhere stated)	18	559 65
Fall from ladder, scaffold	159	7,272 62
Fall from machinery, trucks	44	1,921 95
Fall, collapse of support	146	5,610 48
Fall, opening in floor	30	985 89
Fall, hoistway, shaft	1	21 10
Fall on stairs, steps, etc.	18	441 68
Fall on level, slip	259	8,269 72
Fall on level, tripping	86	3,395 23
Fall, jumping	35	1,022 68
Other falls	43	1,574 09
Falling overhead coal, rock	265	14,092 71
Slide or cave-in	34	1,646 94
Falling pile of material	55	2,057 04
Falling timber, lumber, etc.	83	3,945 53
Falling trees	24	1,581 41
Rolling or moving logs	123	6,956 75
Other falling objects	311	9,676 58
Objects dropped by others	19	500 54

STATISTICAL TABLES—*Continued.*

TABLE NO. 5.—NON-MECHANICAL INJURIES FOR THE YEAR 1917—*Concluded.*

Agency.	No. of Accidents.	Compensation paid. Time Awards.
Falling material, trucks, etc.	51	$ 1,470 64
Handling trucks, barrows, etc.	87	2,290 54
Handling heavy machinery	171	6,190 70
Handling lumber, timber, etc.	448	13,672 37
Cause insufficiently described	3	170 88
Lifting	116	3,064 08
Struck in eye by piece of glass, etc.	156	13,502 21
Other injuries by flying objects	46	1,505 24
Vehicles and accidents by animals	92	2,628 06
Hand-tools	226	6,097 92
Hand-tools with other workmen	32	910 56
Caught on nail, etc.	39	822 83
Cut on glass	10	290 17
Cut by axe or adze	210	7,039 25
Injured by stepping on nail	49	491 87
Injured by hand-saw	52	1,399 98
Injured by pick, peavy, etc.	39	1,050 36
Puncture, splinter, cable, etc.	76	2,314 36
Inhalation of poisonous gas	6	177 83
Lead poisoning	133	4,262 10
All others	96	10,241 49
Totals	4,048	$152,669 72

TABLE NO. 6.—WAGE AVERAGE FOR 1917 OF 5,483 NON-PERMANENT TOTAL DISABILITY CASES FINALLED DURING 1917.

Of the total of 5,483 cases the average daily wage was	$3 61
„ 3,811 English-speaking the average daily wage was	3 70
„ 453 Latins the average daily wage was	3 70
„ 214 Scandivanians the average daily wage was	4 02
„ 155 Germans and Austrians the average daily wage was	3 81
„ 588 Orientals the average daily wage was	2 65
„ 191 Slavs the average daily wage was	3 44

TABLE NO. 7.—NATURE OF INJURIES, NON-PERMANENT TOTAL DISABILITY CLAIMS FINALLED DURING 1917.

	Number of Injuries.	Duration of Disability. (Work-days).	Average Duration of Disability for each Accident (Work-days).
Cuts	1,117	20.626	18.46
Bruises	1,658	33,040	19.93
Sprains	579	10,653	18.39
Punctures	232	3,466	14.94
Fractures	674	31,380	46.57
Dislocations	60	1.888	31.47
Amputations	137	5,536	40.41
Scalds and burns	141	3.092	21.93
Infections	701	20,318	28.99
All others	184	4.070	22.12
Totals	5,483	134.069	...

Average disability of 5,483 cases, 24.45 work-days.

STATISTICAL TABLES—*Continued.*

TABLE NO. 8.—SHOWING THE NUMBER OF FATAL ACCIDENTS REPORTED DURING 1917 AND THE CAUSE OF DEATH.

Mechanical Causes.

Motor-engines	1
Shafting	2
Cables	9
Conveying and hoisting machinery	1
Elevators	1
Railway and rolling-stock	1
Coupling railway-cars	1
Falls from trains	5
Struck by trains	10
Collision and derailment	5
Coal-cars	1
Saws (power-driven)	3
Log-carriages	1
Drilling machinery	1
Total mechanical	42

Non-mechanical Causes.

Explosives	10
Mine explosions	38
Molten metals	1
Electricity	3
Forest fires, heat, etc.	8
Fall, collapse of support	3
Fall through opening in floor	1
Fall down hoistway or shaft	5
Fall on level	1
Other falls	9
Falling overhead coal or rock	12
Slide or cave-in	8
Falling timber, lumber	6
Falling trees	12
Rolling or moving logs	15
Other falling objects	6
Handling lumber	1
Lifting	1
Flying objects	3
Accidents by animals	2
Inhalation of poisonous gas	2
Drowning	22
All others	6
Total non-mechanical	175
Grand total	217

STATISTICAL TABLES—*Concluded.*

TABLE NO. 9.—NATIONALITY TABLE, FATALS, 1917.

Canadian	25
British	84
United States	12
Italian	14
Swedish	8
Norwegian	4
Danish	4
Chinese	7
Japanese	15
Austrian	3
French	9
Belgian	1
Russian	13
Greek	1
Serbian	1
Native of India	2
Swiss	1
Not stated	13
Total	217

NAMES, POSITIONS, AND SALARIES OF STAFF.

Secretary's Office—	
F. W. Hinsdale, Secretary	$325 00
Miriam L. Worswick, Stenographer	75 00
Accounting and Auditing Department—	
F. J. Harding, Cashier and Office Manager	175 00
Grace E. Tait, Assistant Cashier	65 00
Douglas Creighton, Accountant	150 00
F. P. Archibald, Accountant	115 00
Mae Murphy, Stenographer	60 00
Madge Collins, Stenographer	70 00
Aileen Tuttie, Stenographer	60 00
Beatrice Williscroft, Clerk	65 00
Marie E. Hirsch, Clerk	70 00
Winifred Underwood, Stenographer	60 00
Claims Department—	
R. Gardom, Chief Claims Officer	150 00
J. M. Armitage, Chief Claims Adjuster	125 00
R. B. Fulton, Correspondence Clerk	125 00
Maud Ledingham, Clerk	75 00
Alma Irene Till, Stenographer	75 00
Beatrice Fennell, Clerk	70 00
Eleanor Streeter, Clerk	70 00
Norah L. Wilson, Stenographer	70 00
Florence M. Maxam, Clerk	70 00
Dorothy R. Brown, Clerk	65 00
Ada Small, Stenographer	60 00
Lillian Grassett, Clerk	60 00
W. M. Meston, Claims Adjuster	100 00
Medical Department—	
Dr. G. A. B. Hall, Chief Medical Referee	300 00
Madeleine Macrae, Chief Clerk	70 00
Isabella Westwood, Clerk	60 00

Medical Department—*Concluded.*	
May, Sully, Clerk	$ 60 00
Linda Macrae, Clerk	60 00
Chairman's Secretary—	
Olga M. Freeman	80 00
Information Department—	
F. V. Bodwell	115 00
Statistician—	
T. Maitland	100 00
Departmental Solicitor—	
E. N. Brown, Departmental Solicitor	175 00
Estelle Abbott, Stenographer	60 00
Auditors—	
W. B. McDonald	150 00
Wm. McNeish	125 00
T. P. Wilson	100 00
T. S. Brown	100 00
H. Mackenzie	100 00
Wm. Morris	100 00
Exchange Operator—	
Helen Fennell	40 00
Victoria Office—	
H. Pontifex, Auditor	115 00
May Croft, Stenographer	70 00

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

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FIRST ANNUAL REPORT

OF

THE LAND SETTLEMENT BOARD

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE YEAR ENDING

DECEMBER 31ST, 1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

The undersigned has the honour to present the First Annual Report of the Land Settlement Board for the year ending December 31st, 1917.

All of which is respectfully submitted.

JOHN OLIVER,
Minister of Agriculture.

Victoria, B.C., February 12th, 1918.

Land Settlement Board of British Columbia,
Victoria, B.C., February 12th, 1918.

The Honourable John Oliver,
Minister of Agriculture, Victoria, B.C.

Sir,—I have the honour to transmit herewith the First Annual Report of the Land Settlement Board for the year ending December 31st, 1917.

I have the honour to be,
Sir,
Your obedient servant,
MAXWELL SMITH,
Chairman.

Land Settlement Board of British Columbia.

Under and by virtue of chapter 34, Statutes of British Columbia, entitled "An Act to promote Increased Agricultural Production," there was created in the Department of Agriculture a Board, to be called the "Land Settlement Board."

Said Act was assented to on the 19th day of May, 1917, and brought into operation by Proclamation of the Lieutenant-Governor on the 16th day of July, 1917.

Maxwell Smith was appointed Chairman of the Board by Order in Council approved July 21st, 1917, and entered upon his duties on the day that the Act was brought into operation. J. A. Macdonald, D. D. Munro, M. H. Nelems, and C. R. Ward were appointed Directors of the Board by Order in Council approved July 28th, 1917, and assumed office on the 1st day of August, 1917. F. R. E. DeHart was appointed a Director of the Board by Order in Council approved August 29th, 1917, and entered upon his duties on the 29th day of September, 1917.

By virtue of section 45 of said chapter 34, the Land Settlement Board superseded the Agricultural Credit Commission constituted under the "Agricultural Act, 1915," and was empowered to carry out the undertakings of the said Commission.

Details of operations of the Agricultural Credit Commission up to and including the 14th day of July, 1917, are as follows:—

1. Number of applications for loans received during 1916 and dealt with in 1917	337	
Amount of applications as above		$738,120
2. Number of applications for loans received in 1917 and dealt with in 1917	23	
Amount of applications as above		$ 51,200
Total applications dealt with in 1917	360	
Total applied for and so dealt with in 1917		$789,320
Total number of applications received in 1917	215	
Total amount applied for as above		$355,486
Under section 1, loans granted numbered 94.		
Amount applied for of 94 granted loans		$285,900
Amount granted of 94 granted loans		$224,400
Under section 1, the applications refused, withdrawn, or cancelled numbered	243	
Amount of applications so rejected		$452,220
Under section 2, number of applications granted	2	
Amount applied for as above		$ 10,500
Amount of 2 granted loans		$ 10,500
Under section 2, number of applications refused, withdrawn, or cancelled	21	
Amount of applications so rejected		$ 40,700

SUMMARY OF APPLICATIONS DEALT WITH BY AGRICULTURAL CREDIT COMMISSION IN 1917.

	No. of Applications.	Amount applied for.	Amount granted.
1916	94	$285,900	$224,400
1917	2	10,500	10,500
Granted	96	$296,400	$234,900
1916	243	$452,220	.....
1917	21	40,700	.....
Rejected	264	$492,920	.....

Applications granted	96
Applications refused	264
Total	360

SUMMARY OF AGRICULTURAL CREDIT COMMISSION LOANS GRANTED FROM ITS INCEPTION TO DECEMBER 31ST, 1917.

490 loans granted for	$941,950 00
Less 106 loans cancelled or withdrawn	153,400 00
384 loans granted, amount	$788,550 00
Less amount paid on same	675,486 78
Balance owing on loans	$113,063 22

Statement of revenue and expenditure and balance-sheet are submitted herewith.

LAND SETTLEMENT BOARD.

Revenue and Expenditure Account for Year ending December 31st, 1917.

A.C.C. Accounts.

EXPENDITURE.		REVENUE.	
Salaries to July 16th, 1917:		Interest on deposits	$14,367 02
Office	$4,727 69	Interest on loans	34,527 51
Appraisers	930 93	Interest on investment of Sinking Fund	648 02
Commissioners	1,950 00	Appraisal fee	2,578 31
	$ 7,608 62	Legal fees	1,750 90
Travelling expenses to July 16th, 1917:		Balance: Deficit on year's operations to December 31st, 1917, carried to balance-sheet	22,200 92
Appraisers	$1,824 70		
Commissioners	759 15		
	2,583 85		
Proportion expenses, July 16th to Dec. 31st, 1917:			
Directors' expenses, etc	$5,359 43		
Office salaries, etc	3,618 08		
	8,977 51		
Printing, stationery, etc	1,455 43		
Furniture and fixtures, 10 and 20 % written off	123 23		
Telephone and telegraph account	95 56		
Legal expenses and trustees fees	215 00		
Interest on debentures	45,000 00		
Interest rebate on loans	3,762 05		
Exchange, discount, and commission	42 22		
U.S. premium on coupons	69 41		
Refunds granted on loans	27 80		
Discount on debentures, 1/25 written off	6,112 00		
	$76,072 68		$76,072 68

Land Settlement Board.

Statement of Assets and Liabilities as at December 31st, 1917.

A.C.C. Accounts.

ASSETS.		LIABILITIES.	
Cash, Canadian Bank of Commerce, current account	$ 128,247 96	Debentures	$1,000,000 00
Cash on hand	305 85	Appraisal fees	277 50
Canadian Bank of Commerce, coupon account	766 64	Coupons unpaid	1,147 50
Discount on debenture sales	142,613 34	Accrued interest on debentures	7,500 00
Furniture and fixtures	616 22	Outstanding accounts	10,005 22
Loans on security of first mortgages	665,843 26		
Overdue interest	2,086 12		
Accrued interest on loans	10,730 27		
Sinking Fund	26,504 32		
Balance: Deficit 1916	$19,015 32		
Add deficit 1917	22,200 92		
Total deficit to Dec. 31st, 1917	41,216 24		
	$1,018,930 22		$1,018,930 22

By permission of the trustees for the debenture-holders and with the approval of the Executive Council, "Victory Loan" bonds were purchased to the value of $53,000, on which a deposit of 10 per cent. has been made from the Sinking Fund Account, and on which we make a net gain of 2 per cent.

The Land Settlement Board took over and passed upon applications received by the Agricultural Credit Commission, as per details following:—

Report of Land Settlement Board to December 31st, 1917.

1.	Number of Agricultural Credit Commission applications dealt with by the Land Settlement Board in 1917	412
	Total of applications as above	$703,711
	Number of applications granted as per above	149
	149 loans, amount applied for	$260,600
	149 loans granted for	$222,450
	Number of applications as above, refused, withdrawn, or cancelled	208
	Amount of applications as above, refused, withdrawn, or cancelled	$322,411
	Number of applications as above, appraised, now pending	55
	Amount of applications as above, pending	$120,700
2.	Number of applications received by the Land Settlement Board, July 16th to December 31st	135
	Amount of applications as above	$294,906
3.	Number of Land Settlement Board applications dealt with in 1917	103
	Amount of applications dealt with	$243,126
	Number of applications granted under section 3	55
	Amount of 55 loans applied for	$173,926
	Amount of 55 loans granted	$153,950
	Number of applications refused, withdrawn, or cancelled under above section 3	36
	Amount of applications refused, withdrawn, or cancelled	$ 53,850
	Number of applications appraised, action pending under above section 3	12
	Amount of applications appraised, pending as above	$ 15,350
	Number of Land Settlement Board applications unappraised at December 31st	32
	Amount of such unappraised applications	$ 51,780

SUMMARY OF AGRICULTURAL CREDIT COMMISSION APPLICATIONS DEALT WITH BY THE LAND SETTLEMENT BOARD DURING 1917.

	No. of Applications.	Applied for.	Granted.
Granted	149	$260,600	$222,450
Refused	208	322,411	.....
Pending	55	120,700	.....
Totals	412	$703,711	$222,450

There are also Agricultural Credit Commission applications still unappraised numbering 53
Amount applied for ..... $ 70,200

SUMMARY OF LAND SETTLEMENT BOARD APPLICATIONS DEALT WITH IN 1917.

	No. of Applications.	Applied for.	Granted.
Granted	55	$173,926	$153,950
Refused	36	53,850	.....
Pending	12	15,350	.....
Totals	103	$243,126	$153,950

SUMMARY OF APPLICATIONS UNAPPRAISED AT DECEMBER 31ST, 1917.

	No. of Applications.	Applied for.
Agricultural Credit Commission	53	$70,200
Land Settlement Board	32	51,780
Totals	85	$121,980

LAND SETTLEMENT BOARD.

163 loans granted for	$332,650 00
Less 6 loans withdrawn or cancelled	13,500 00
157 loans granted, amount	$319,150 00
Amount paid on loans	60,576 15
Amount owing to complete loans	258,573 85

Statement of revenue and expenditure and balance-sheet are herewith submitted.

LAND SETTLEMENT BOARD.

Revenue and Expenditure Accounts for Year ending December 31st, 1917.

L.S.B. Accounts.

EXPENDITURE.			REVENUE.	
Salaries:			Proportion A.C.C. Directors' salaries and expenses	$ 5,359 43
Directors	$4,036 65		Proportion A.C.C. office salaries and expenses	3,618 08
Office staff	5,018 69		Appraisal fees earned	651 00
		$ 9 055 34	Exchange, discount, and interest	1 47
Travelling expenses:			Legal fees	2,013 30
Directors	$3,590 64		Accrued interest on loans	516 15
General	29 60		Balance: Deficit on operations to December 31st, 1917, carried to balance-sheet	1,534 53
		3,620 24		
Office expenses:				
Postage	150 00			
General	20 48			
Stationery	457 35			
Telephone	20 21			
Furniture and fixtures	27 56			
		675 60		
Interest on moneys advanced by the Government		342 78		
		$13,693 96		$13,693 96

LAND SETTLEMENT BOARD.

Statement of Assets and Liabilities as at December 31st, 1917.

L.S.B. Accounts.

ASSETS.		LIABILITIES.	
Loans granted	$319,150 00	Appraisal fees (unearned)	$ 195 00
Members impress account	1,200 00	Province of British Columbia: Advances	74,966 09
Land purchase account	3,215 35	Due to borrowers	258,435 05
Accrued interest on loans	516 15	Accounts payable	1,217 23
A.C.C. proportion of expenses	8,977 51		
Accounts receivable	29 05		
Furniture	190 78		
Balance: Deficit	1,534 53		
	$334,813 37		$334,813 37

I have examined the books and accounts of the Land Settlement Board (including the separate books and accounts of the Agricultural Credit Commission) and certify that the balance-sheets submitted herewith exhibit a true and correct view of the financial position of the Board at 31st December, 1917, as disclosed by the books and after making adjustments for accounts due to the King's Printer and the Public Works Department, which have not as yet been incorporated in the books of the Board.

(Sgd.) A. N. MOUAT,
Comptroller-General.

The large number of applications for loans requiring attention has kept the Directors busy with appraisal work since their appointment.

But, in addition to bringing this work nearly up to date (before snowfall in the Interior of the Province), the Directors have collected a mass of important information and reliable data that will be of immense value in successfully prosecuting the land settlement and development enterprises of the Board during the coming year.

The general policy of the Land Settlement Board is to reduce the money-loaning feature to the minimum necessary, and to promote land settlement and development work to the fullest extent, along lines consistent with sound business principles, in accordance with the letter and spirit of the "Land Settlement and Development Act," and with a view to stimulating rapid and judicious development of the agricultural areas of the Province.

In the furtherance of these objects, it is our aim:—

(*a.*) To first direct our efforts to the settlement and development of those agricultural areas situated convenient to transportation facilities and available for production at the smallest possible cost:

(*b.*) To adopt the necessary measures to establish community settlements in the areas suitable for mixed farming, fruit-growing, and all branches of agriculture requiring intensive cultivation:

(*c.*) To cultivate the active and sympathetic co-operation of the Faculty of the University of British Columbia and all other reliable authorities in determining the products for which specific areas are best adapted:

(*d.*) In the active carrying-out of our development enterprises, to foster the co-operation of the Department of Lands, the Public Works Department, and all other branches of the public service in harmonizing and co-ordinating public expenditure in the areas affected.

All of which is respectfully submitted.

MAXWELL SMITH,
Chairman.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

ANNUAL REPORT

OF THE

MENTAL HOSPITALS

OF THE

PROVINCE OF BRITISH COLUMBIA

FOR THE YEAR 1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

Recreation ground, New Westminster

Mental Hospital, New Westminster

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

The undersigned respectfully submits herewith the Annual Report of the Medical Superintendent of the Mental Hospitals for the year 1917.

J. D. MacLEAN,
Provincial Secretary.

Provincial Secretary's Office,
February, 1918.

Members of the Provincial Mental Hospitals and Colony Farm Staffs who have joined the Colours.

Major C. E. Doherty, M.D. Captain D. D. Freeze, M.D.

Lieutenant R. Cullen.

Sergeant-major H. Banham. Sergeant-major E. Croft.

Sergeant J. O'Reilly. Sergeant D. Montgomery.

Corporal H. Hoult.

HONOUR ROLL.

✠

KILLED IN ACTION.

✠

S. McCOMBE,
Private, 104th Westminster Fusiliers.

J. McDONALD,
Trooper, British Columbia Horse.

L. BUNDY,
Private, 104th Westminster Fusiliers.

F. UPHAM,
Reservist, Somerset Light Infantry.

W. H. WILLIAMS,
Private, 104th Westminster Fusiliers.

A. MILNE,
Private, 62nd Battalion, C.E.F.

Private A. Talbot.
Private E. Orme.
Private W. D. Patchell.
Private T. Woodburn.
Private T. E. Morris.
Private D. Price.
Private D. Hughes.
Private W. McVie.
Private A. McLennan.
Private F. E. Frankum.
Private A. N. Campbell.
Private A. Hall.
Private A. M. Exley.
Private Benj. Jones.
Private W. Crystall.
Private J. Loban.
Private E. Dickie.
Private F. Upham.
Private J. McDonald.
Private S. McCombe.
Private W. H. Williams.
Private A. M. Miller.
Private L. Bundy.
Private G. Farrant.
Private W. Robertson.
Private W. Headridge.
Private C. Oxenbury.
Private G. B. McNaughton.
Private J. Davidson.
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Private A. Milne.
Private H. A. Sparrow.
Private W. Ronald.
Private J. Robertson.
Private G. Davidson.
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Private H. Bailey.
Seaman W. Mackie.

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J. G. McKay, M.D., C.M., *Acting Medical Superintendent.*
H. C. Steeves, M.D., C.M., *Assistant Medical Superintendent.*
E. J. Ryan, M.D., C.M., *Assistant Physician.*

T. H. Cambridge, *Bursar.*
M. H. McCabe, *Assistant Bursar.*
W. E. Hunt, *Clinical Clerk & Stenographer.*
Maria Fillmore, *Matron.*
R. Rees, *Steward and Storekeeper.*
Rev. R. Lennie, Church of England, } *Chaplains.*
Rev. Father Murphy, Roman Catholic, }
W. F. Johnston, *Engineer.*
F. Spooner, *Acting Chief Male Attendant.*
Thomas Cormack, *Carpenter.*
J. Fraser, *Farmer.*
J. Booth, *Gardener.*
D. Sclater, *Painter.*
W. F. Beggs, *Tailor.*
E. B. Jones, *Laundryman.*
J. MacMillan, *Shoemaker.*
H. Oliver, *Plumber.*

Officers of Essondale and Colony Farm.

J. G. McKay, M.D., C.M., *Acting Medical Superintendent.*
A. L. Crease, M.D., C.M., *Assistant Physician and Pathologist.*

Gowan S. Macgowan, *Bursar.*
C. Fletcher, *Assistant Bursar.*
C. H. Gooding, *Analyst.*
H. W. Strong, *Clinical Clerk's Stenographer.*
J. B. Pumphrey, *Steward and Storekeeper.*
J. L. Malcolm, *Engineer.*
Rev. C. Yates, Church of England, } *Chaplains.*
Rev. Father Marcucci, Roman Catholic, }
G. Mathewson, *Chief Attendant.*
T. Mowbray, *Electrician.*
J. B. Foster, *Cook.*
A. A. Killen, *Painter and Decorator.*
E. B. Stinchcombe, *Outside Overseer.*
A. G. Parrott, *Plumber.*
R. Gow, *Carpenter.*
E. Fitzgerald, *Plasterer and Mason.*
S. F. Hambly, *Baker.*
J. Hargie, *Laundryman.*
A. Robinson, *Barber.*
T. H. Moore, *Farm Superintendent.*
J. F. Simmonds, *Record Clerk.*

Driveway to Hospital, New Westminster.

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REPORT OF MEDICAL SUPERINTENDENT

FOR THE YEAR ENDING DECEMBER 31ST, 1917.

PROVINCIAL MENTAL HOSPITAL,
ESSONDALE, B.C., January 31st, 1918.

The Honourable the Provincial Secretary,
Victoria, B.C.

SIR,—As Acting Medical Superintendent of the Provincial Mental Hospitals, I have the honour to submit to you our Forty-sixth Annual Report for the year ending December 31st, 1917.

As in former years, you will find herewith statistical, financial, and working tables, showing the exact movements of the residential population and an accurate accounting of all moneys received and disbursed; also tables covering the work of the various departments carried on throughout the year.

In addition to the above report, which only refers to the Hospitals' records, I will, with your permission, call attention to certain existing social conditions, as I believe it to be the duty of any Medical Superintendent to not only see that his hospital cases are properly treated, but also to make suggestions whereby the percentage of admissions in relation to the population might be lessened.

Before proceeding further, however, I wish to again call to your attention, as I have in my two former reports, and also to personally pay just tribute to the members of our staff who are serving or have served overseas. Six of them have paid the supreme sacrifice, several have returned wounded and invalided from the service, and the balance are still serving with the colours on the Western Front. To the families of those killed in action we extend our most sincere sympathies, and to the members still serving, our best wishes for a safe return and an assurance that their positions will be held for them.

Our admissions during the year totalled 371; 245 being men and 126 women. This total exceeds that of 1916 by eighteen, and makes a total in residence at the end of December, 1917, of 1,301, and a residential increase of ninety-six, which is an average one compared with the past few years, and which will continue yearly on the same basis unless more stringent methods are adopted along etiological and prophylactic lines. To do this with any degree of efficiency more drastic laws will have to be enacted as a protection to the populace, who, through ignorance, continue along the same lines to their own detriment and that of the future generation.

To appreciate the above remarks more fully, I beg to call your attention to the fact that we were able to obtain an hereditary history in seventy-eight, or nearly 20 per cent. of those admitted, and undoubtedly a great many more of those unclassified would come under the same category were we able to obtain an authentic history from them. This condition can be alleviated to a great extent in many ways, but foremost by the Dominion authorities being more strict at ports of entry to Canada, and demanding that all immigrants be thoroughly examined, not only from a physical but from a mental standpoint as well, so that we would be protected not only from those who are actually mental cases, but also from that class who would ordinarily pass muster, but whose progeny would in all probability be mentally deficient, and would either have to undergo treatment in a strictly mental sense or placed in an institution for mentally deficient children.

Second to that of heredity, from a standpoint of etiology, comes syphilis, which was the direct cause of 10 per cent. of our admissions, and of whom all but two were suffering from general paresis, which does not react to treatment. I would therefore again suggest that syphilis be placed in the same category as smallpox, tuberculosis, and other infectious diseases, so that all cases would have to be reported to the health authorities and forced to undergo proper treatment, as the majority come under the influence of charlatans who, through their flash advertising, are reaping a financial harvest at the expense of these unfortunate cases, carrying them along on a false security until their condition reaches a stage where it will not react to treatment.

My reasons for making these statements are that the percentage of admissions of cases of general paresis are on the increase not only in our Hospitals, but in all others that I have had an opportunity of communicating with. In fact, the Province of Ontario has appointed a Commission to obtain statistics that they may draft an Act based on the Western Australian Act, which compels all cases to be reported and treated.

To assist in this work we are at the present time doing a Wassermann test on each admission, and should the case show a positive reaction are notifying the husband or the wife, as the case may be, and are offering to do their blood examination, as well as that of their children, free, so that they may, if necessary, undergo treatment. As an example, in one family where we examined the blood of the parents and children we obtained a negative reaction from the father, but positive ones from each of the children. This routine, if carried out by all hospitals, would undoubtedly decrease in the next decade by at least 50 per cent. the number of admissions of general paresis.

The congenital deficients, who are usually the progeny of the above-mentioned classes, are also on the increase and go to make up a large percentage of what we classify as "chronics." Many of these cases could be treated much more satisfactorily if they were segregated, so that they might be educated to a limited degree, thereby making them more or less self-supporting, but this cannot be done under the present regime.

In addition to these conditions mentioned, I wish also to refer to the fact that we are receiving quite a number of patients from other Provinces, due, I believe, to the lower altitude and milder climate of the Coast area. Would it not be possible to make an interprovincial arrangement whereby these cases would be maintained here at a rate sufficiently high to recompense this Province, or have them returned to their home Provinces?

LABORATORY.

During the past year we were again unable to carry on this branch satisfactorily owing to our being short-handed from a medical standpoint, but during the latter part of the year this difficulty was overcome and considerable good work was accomplished, as will be shown in Dr. Crease's report. I personally feel that an up-to-date laboratory is as essential to the welfare of a mental hospital as any other department, as it is only through such a medium that information of a real authentic nature can be obtained. The routine blood and urine examinations will in themselves often bring to our notice an existing condition which would readily have been overlooked had such not been made, and permit us to get the patient under proper treatment at the earliest possible date. Further than the ordinary routine, we are carrying on research-work which I believe will be particularly advantageous to us in the future.

During the latter part of December we had an outbreak of diphtheria, which, although not severe in type, nevertheless caused considerable inconvenience, and had we not had our laboratory working in full force it would have been the cause of a material expenditure of money.

DENTISTRY.

In my previous report I called your attention to the placing on our staff, during the year of 1916, of Dr. Smith as dentist to the institutions, who devotes one day of each week to this work. This procedure has proven of inestimable value to the welfare of the patients, as a great percentage of our admissions have neglected their teeth and many are in a deplorable condition, which has a most detrimental effect upon their digestive system. A regular routine examination is made of all wards and cases are treated as required, both from a prophylactic and curative standpoint.

AMUSEMENTS AND OCCUPATIONS.

Amusement and occupation are just as much a part of the treatment as medicine or hydrotherapy in psychopathic work, and should be dealt with just as judiciously. From a standpoint of occupation we are, on account of our geographical position and also possessing 1,400 acres of land, much more fortunate than many institutions located in or near large cities, who must necessarily find employment for their patients indoors instead of outside. The greater portion of the residential population of any mental hospital is of the chronic type, and it is for this class of case that regular employment must be found; first, for their physical welfare, and, secondly, that they may to a slight degree aid towards their own maintenance.

Front entrance to Hospital.

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It is also essential to surround patients with as pleasing an atmosphere as possible, so that they may in a sense get away from their morbid thoughts. This we do by having comfortable recreation-rooms, plenty of suitable literature, and, during the winter months, devoting one evening of each week to moving pictures, which are very highly appreciated by the great majority. During the summer months the opportunity to get outside makes it much easier to find satisfactory amusements.

NEW WORK.

During the past year we have endeavoured, even more than ever before, to construct, ourselves, any buildings required by the Hospital, and have erected a new laundry of cement blocks, with double walls having a 2-inch air-space between. This building has a floor area of 100 x 60 feet, and when completed will not have cost more than $9,000. Had the same been constructed under contract and the same excavation made, it would have cost at least $20,000, as it was necessary for us to move 6,000 yards of dirt before we could lay our foundation. In addition to this, we have constructed a new cow-barn on the upland at a cost of $1,200. This is a frame-and-concrete building 32 x 46 feet. We have also cleared 20 acres of land, and moved in all some 25,000 yards of dirt in reinforcing dykes, grading, and road-building. All of the above is extra to the general routine work carried on in connection with the Hospital.

EXPENDITURES.

The great national demand for economy has been kept ever before us without in any way interfering with the welfare of our patients, and I am pleased to be able to report that our gross *per capita* cost was 63.52 cents per diem, which is slightly less than that of 1916. In referring to Table D you will note that this charge covers all expenditures, whether paid by voucher or obtained from our farm or nurseries at prices based upon those had we purchased same in the open market. The total expenditure for the two Hospitals is as follows: Paid out by voucher, $281,682.48, with charges from farm and gardens, together with differences in inventories, $8,673.36, making a total net expenditure of $290,355.84. As a partial offset to this expenditure we have remitted to the Treasury $46,786.02, thereby making a net cost to the Province of $243,569.82, or 53.28 cents *per capita per diem*.

ESTIMATES FOR MAINTENANCE.

Owing to the steady increase in the cost of all commodities required for the maintenance of our Hospitals and farm, it has been very difficult to estimate with any degree of accuracy the amounts that will be required, but after conferring with many of the leading merchants in various lines I have submitted for your approval the following: For the Public Hospital for Insane, New Westminster, $156,964; for the Mental Hospital, Essondale, $206,020.72; for Colony Farm, $37,935; and for the nursery, $8,880. We have based the above estimates upon a *per capita* cost of $240 per annum, which is some $9 higher than the cost for the year 1916.

REQUIREMENTS.

I have further submitted for your approval estimates as follows:—

Acute or Admission Building	$175,000 00
Residence for Assistant Medical Superintendent	4,000 00
Six cottages for employees who should always be on the premises, $1,200 each	7,200 00
Installation of new bake-oven	3,000 00
New piggery	3,000 00
Clearing land	4,500 00

All of the above are most urgently needed if we are to carry on the work with any degree of efficiency.

COLONY FARM.

As our farm is maintained under a separate vote, although essentially a part of the Hospitals, I feel that I should, in a sense, make my report under a separate heading. It is now conceded by all authorities that a farm is necessary to carry out a line of treatment which requires outdoor occupation, as well as to supply suitable farm produce, as vegetables, milk, butter, etc.

During the past year we have disposed of a great many of our horses which were not required for farm-work and which were proving an unprofitable investment. In addition to this, we are now relieved of the Sunbury Farm, that the Hospitals had under lease, and which showed an annual deficit of from $4,000 to $5,000. We are therefore starting our present calendar year under much more favourable conditions.

As our residential population is increasing annually, so, too, must our dairy herd, and realizing this we have not disposed of any females since the fall of 1914, excepting non-producers, or the destruction of any found infected which might be a source of contagion to the herd. This latter procedure we have rigorously observed by semi-annual tests, as well as general inspection. During the above-mentioned time we have increased the females from 99 to 141 head, and hope by the end of the fiscal year 1918-19 to have sufficient milkers not only to supply the requisite amount of milk required by the Hospitals, but also for the manufacture of the greater part, if not all, of the butter used, which amounts to 100 lb. per day.

The herd, as you know, are all registered Holsteins, and are now conceded to equal, if not excel, any other Canadian herd, and, in addition to supplying our own requirements, gives the dairymen of the Province an opportunity of purchasing animals of a high grade which, when intermingled with their own herds, must necessarily prove beneficial.

In addition to the cattle and horses, we are now running some 150 head of sheep, and hope to increase this number as they have proven a profitable investment.

Incorporated in this report you will find a financial report submitted to me by our Bursar, and in this you will see that for the first time since the inception of the farm it has shown an actual profit, and I am sure that in future this should not only continue, but show a material increase, as I am unable to see any reason why we cannot maintain it on a purely commercial basis without in any way interfering with its original object; i.e., that of the care of the mentally afflicted.

I would suggest that the sum of $2,000 be set aside as a contingent or trading account, so that we might be able to purchase feeders to utilize any superfluous feed or pasture that we might have, and these could be sold or used as meat for the Hospitals.

In addition to the above, would it not be feasible to have the moneys received from the sale of stock credited to the Colony Farm vote, so that the Public Accounts would only show the actual profit or deficit, as the case might be?

ACKNOWLEDGMENTS.

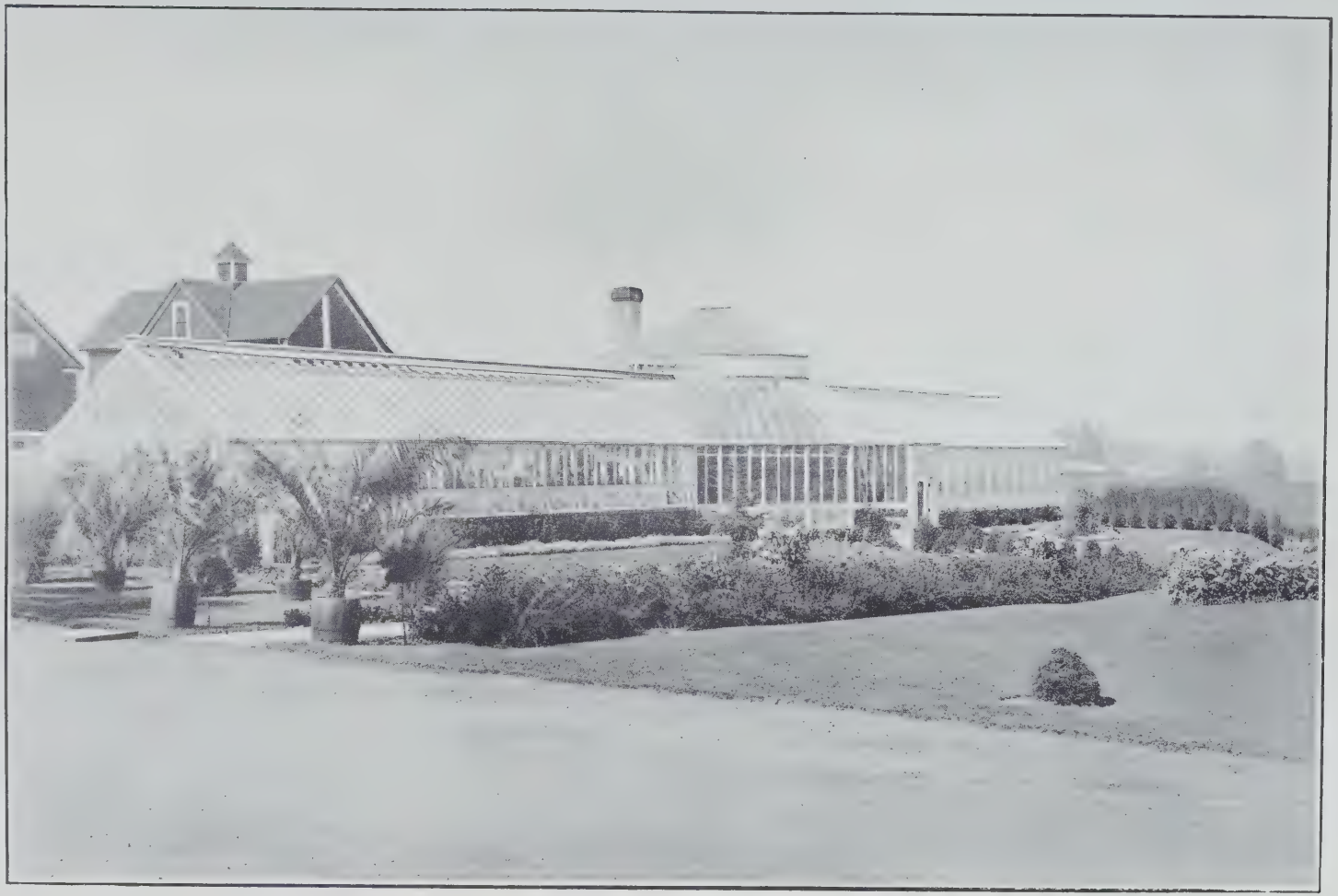
I wish to extend to all members of the staff my most sincere thanks for their able assistance in carrying on the work of the Hospitals, as it is only through well co-ordinated action that the best results can be obtained.

To my medical associates, Dr. H. C. Steeves, Assistant Medical Superintendent at New Westminster, and Dr. A. L. Crease, Assistant Medical Superintendent at Essondale, and Dr. E. J. Ryan, Assistant Physician, I feel specially indebted, as at many times during the past year their work has been exceptionally strenuous and trying.

In conclusion, I beg to offer my sincere appreciation to yourself for the able assistance that you have granted me in endeavouring to carry on the work of caring for those cases who must necessarily come under treatment in the Mental Hospitals which are under your Department.

I have the honour to be,
Sir,
Your obedient servant,

J. G. McKAY,
Acting Medical Superintendent.



Greenhouse, New Westminster.

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TABLE A.

Showing the Average Number of Patients in Residence each Year, the Total Amounts spent for Maintenance, and the *Per Capita* Cost.

Year.	Average Number in Residence.	Maintenance Expenditure.	*Per Capita* Cost.
1872 (81 days)	16.57	$ 2,265 25	$616 00
1873	16.07	7,841 94	487 98
1874	16.76	8,232 41	491 20
1875	27.42	9,892 38	360 77
1876	36.41	12,558 18	344 91
1877	34.61	12,917 17	373 26
1878	36.52	13,985 05	382 93
1879	38.17	10,253 72	268 63
1880	45.42	10,552 18	232 32
1881	47.18	10,691 76	226 62
1882	47.86	11,343 65	237 02
1883	48.73	11,829 11	242 75
1884	48.70	11,843 94	243 20
1885	54.67	15,555 87	284 54
1886	59.11	15,334 43	259 42
1887	73.55	15,945 22	216 70
1888	79.43	16,261 06	204 72
1889	71.30	15,657 79	219 60
1890	78.78	17,577 80	223 13
1891	119.87	21,757 03	181 50
1892	125.24	23,518 37	187 80
1893	133 92	25,904 98	193 36
1894	148.64	26,495 83	178 25
1895	162.97	31,587 89	193 83
1896	171.43	32,001 40	186 67
1897	188.91	36,224 76	191 75
1898	216.53	46,420 25	214 38
1899	226.44	54,917 45	242 52
1900	243.24	59,349 20	244 00
1901	269.56	55,406 08	205 54
1902	296.62	55,345 65	186 59
1903	332.23	59,353 57	178 65
1904	351.55	66,052 76	187 89
1905	340.90	63,342 07	185 80
1906	374.57	66,596 69	177 79
1907	419.24	74,874 64	178 59
1908	490.80	90,269 49	183 92
1909	526.85	96,586 32	183 32
1910	563.33	103,900 44	184 43
1911	641.02	126,782 50	197 78
1912	736.72	130,924 06	177 71
1913, M.H., New Westminster	550.54	119,663 71	217 36
1913, M.H., Essondale (9 months)	384.07	71,079 84	184 76
1914, M H., New Westminster	487.24	125,981 45	258 56
1914, M.H., Essondale	489.07	131,420 44	268 36
1915, M.H., New Westminster	515.74	123,021 70	238 53
1915, M.H., Essondale	560.56	123,878 43	220 99
1916, M.H., New Westminster	524.17	116,052 21	221 40
1916, M.H., Essondale	633.13	155,698 37	245 91
1917, M.H., New Westminster	535.66	124,124 68	231 72
1917, M.H., Essondale	716.35	166,231 51	232 05

TABLE B.

Showing Analysis of the *Per Capita* Cost.

Year.	Salaries.	Provisions.	Clothing.	Fuel and Light.	Furniture.	Medicines.	Miscellaneous.	Total.
1872.....	$279 38	$184 03	$55 81	$22 44	$15 55	$10 18	$49 30	$616 69
1873.....	221 48	166 81	14 55	23 65	21 59	7 74	32 16	487 98
1874.....	231 10	152 10	22 07	23 98	28 36	7 78	25 81	491 20
1875.....	153 82	113 40	13 98	16 88	25 45	6 73	30 51	360 77
1876.....	143 34	114 45	18 68	22 75	17 90	2 86	24 93	344 91
1877.....	177 15	126 75	20 69	4 66	20 75	3 74	19 52	373 26
1878.....	176 16	124 23	30 43	13 94	7 20	9 16	21 82	382 93
1879.....	134 27	95 10	3 25	15 91	6 39	6 31	7 40	268 63
1880.....	111 84	87 71	5 74	14 06	6 00	3 63	3 34	332 32
1881.....	112 44	81 14	6 86	12 73	5 55	2 56	5 34	226 62
1882.....	121 51	84 52	7 05	12 30	4 54	3 49	3 61	237 02
1883.....	123 81	92 56	6 03	11 04	4 26	2 24	2 82	242 75
1884.....	124 02	90 64	7 03	12 43	4 14	2 77	2 18	243 20
1885.....	169 05	84 33	6 33	15 05	3 90	2 93	2 95	284 54
1886.....	159 03	69 35	5 49	16 20	3 72	1 59	4 04	259 42
1887.....	127 80	59 10	5 88	15 38	3 88	93	3 81	216 78
1888.....	118 34	60 47	4 41	13 90	3 11	2 09	2 40	204 72
1889.....	131 76	59 11	7 20	12 93	4 13	2 07	2 46	219 60
1890.....	121 54	62 77	9 02	17 31	4 00	1 29	7 19	223 12
1891.....	88 35	54 79	3 83	20 43	3 40	1 89	8 81	181 50
1892.....	94 25	56 74	4 69	20 53	3 35	1 80	6 42	187 80
1893.....	95 50	53 55	5 43	22 60	3 39	2 69	10 20	193 36
1894.....	87 76	57 07	5 25	18 83	2 98	1 43	4 93	178 25
1895.....	90 83	61 15	9 90	20 41	2 51	3 10	5 93	193 83
1896.....	89 13	55 93	6 30	20 29	2 56	3 63	8 83	186 67
1897.....	89 09	58 18	8 36	19 11	2 95	3 86	10 20	191 75
1898.....	94 68	69 43	9 94	21 82	2 76	5 12	10 62	214 37
1899.....	113 31	72 91	8 31	33 96	2 50	2 73	8 80	242 52
1900.....	116 04	72 62	9 06	32 10	2 15	1 71	10 32	244 00
1901.....	99 16	66 65	10 12	18 52	3 25	1 07	6 77	205 54
1902.....	87 47	61 13	7 95	15 25	4 13	1 20	9 46	186 59
1903.....	82 36	57 86	8 58	14 77	3 24	1 91	9 93	178 65
1904.....	87 43	60 01	6 85	17 84	4 48	2 10	9 18	187 89
1905.....	92 17	54 09	5 99	17 93	3 83	2 03	9 76	185 80
1906.....	88 76	53 15	5 16	15 92	3 57	1 21	10 02	177 79
1907.....	89 18	48 47	5 81	19 82	3 02	1 57	10 72	178 59
1908.....	90 93	49 17	6 61	17 63	4 56	1 79	13 23	183 92
1909.....	94 27	53 41	8 16	13 02	2 78	84	10 84	183 32
1910.....	95 97	48 43	7 87	21 32	2 02	1 15	7 67	184 43
1911.....	97 44	58 08	9 39	18 84	1 12	1 87	11 04	197 78
1912.....	78 40	56 37	10 09	19 36	1 79	1 50	10 20	177 71
1913, M.H., New West.	102 37	54 07	9 43	25 27	4 74	3 21	18 27	217 36
1913, M.H., Essondale.	93 56	49 90	5 50	25 13	55	1 02	14 10	184 76
1914, M.H., New West.	115 72	68 15	2 99	24 13	69	2 64	44 24	258 56
1914, M.H., Essondale.	113 06	81 42	15 49	28 93	4 14	1 19	24 13	268 36
1915, M.H., New West.	110 94	64 32	7 57	20 30	....	1 88	33 52	238 53
1915, M.H., Essondale.	95 25	62 84	9 44	24 87	1 14	56	26 89	220 99
1916, M.H., New West.	105 89	74 96	2 58	18 52	....	1 45	18 00	221 40
1916, M.H., Essondale.	89 26	75 18	17 76	26 96	4 98	42	31 35	245 91
1917, M.H., New West.	103 41	72 20	10 52	18 29	....	2 38	24 92	231 72
1917, M.H., Essondale.	83 57	79 98	18 92	23 39	4 77	81	20 61	232 05

TABLE C.

Showing the Total Expenditure of the Mental Hospital annually since its Inception, analysed under its Various Headings.

Year.	Salaries.	Provisions.	Clothing.	Fuel and Light.	Furniture (estimat'd)	Medicines, etc.	Miscellaneous.	Total of Current Expenditure.	Expenditure on Capital Account.			
									New Furniture.	Library.	Surgical Instruments.	Lands and Works.
1872-87	$91,899 70	$59,567 24	$6,482 84	$9,317 03	$5,331 52	$2,307 04	$6,131 55	$181,042 26	$2,600 00	.....	.....	$917 26
1888	9,399 96	4,803 57	350 17	1,103 86	247 24	165 60	190 66	16,261 06	.....	.....	$ 32 00	224 34
1889	9,390 62	4,214 19	513 73	922 00	293 69	147 76	175 80	15,657 79	.....	.....	.....	625 56
1890	9,575 13	4,945 57	710 64	1,363 52	315 28	101 90	565 96	17,577 80	2,800 00	.....	.....	2,181 91
1891	10,590 28	6,568 27	459 58	2,449 09	406 84	226 31	1,056 66	21,757 03	900 00	.....	.....	1,001 86
1892	11,803 83	7,106 64	587 48	2,571 26	418 82	226 19	804 15	23,518 37	.....	.....	.....	433 99
1893	12,790 28	7,172 53	729 38	3,029 00	452 55	362 08	1,369 16	25,904 98	650 00	$ 19 00	10 75	718 49
1894	13,044 16	8,492 53	771 05	2,799 87	442 69	212 86	732 67	26,495 83	200 00	.....	.....	170 32
1895	14,802 47	9,963 54	1,611 96	3,324 54	419 01	502 90	963 47	31,587 89	1,800 00	.....	.....	1,915 28
1896	15,280 62	9,588 22	1,079 85	3,479 46	439 36	623 24	1,511 05	32,001 40	800 00	.....	148 01	1,126 74
1897	16,829 76	10,991 05	1,579 08	3,610 03	557 97	728 73	1,928 14	36,224 76	1,200 00	5 15	19 00	848 38
1898	20,502 31	15,032 71	2,153 11	4,725 96	598 05	1,109 66	2,298 45	46,420 25	2,700 00	.....	6 39	5,320 30
1899	25,658 15	16,511 05	1,882 13	7,690 35	566 86	617 27	1,991 64	54,917 45	1,300 00	8 60	.....	2,518 80
1900	28,224 96	17,665 60	2,203 97	7,807 15	521 96	415 10	2,510 46	59,349 20	2,400 00	29 10	11 89	1,806 10
1901	26,729 01	17,967 31	2,727 11	4,993 67	875 30	288 40	1,823 28	55,406 08	1,840 53	25 10	14 65	5,175 20
1902	25,945 89	18,132 13	2,359 90	4,525 45	1,221 87	354 38	2,806 03	55,345 65	1,157 47	104 20	19 20	5,561 42
1903	27,362 37	19,222 50	2,850 19	4,906 22	1,077 73	634 16	3,300 40	59,353 57	1,723 70	111 48	9 00	8,426 70
1904	30,735 95	21,096 19	2,409 34	6,271 55	1,574 84	738 85	3,226 04	66,052 76	1,463 48	132 53	16 95	4,593 88
1905	31,421 45	18,437 99	2,043 45	6,110 76	1,306 22	693 49	3,328 71	63,342 07	1,711 84	91 47	69 15	3,981 72
1906	33,243 80	19,908 19	1,934 15	5,965 32	1,337 80	453 41	3,754 02	66,596 69	1,365 76	100 30	114 16	5,564 03
1907	37,394 21	20,326 99	2,439 64	8,314 36	1,265 63	655 66	4,498 15	74,874 64	4,352 22	150 88	144 63	9,410 66
1908	44,626 20	24,132 49	3,244 77	8,652 81	2,239 68	877 40	6,496 14	90,269 49	5,646 86	127 50	91 01	10,775 00
1909	49,665 85	28,142 65	4,298 91	6,856 11	1,465 79	441 59	5,715 42	96,586 32	2,598 95	89 58	21 30	16,615 10
1910	54,049 80	27,278 49	4,437 29	12,014 30	1,141 57	653 09	4,325 90	103,900 44	4,043 58	139 76	9 50	12,465 08
1911	62,453 00	37,229 56	6,020 57	12,079 62	722 10	1,200 92	7,076 73	126,782 50	11,169 78	154 75	43 82	14,429 02
1912	57,755 68	41,531 72	7,433 68	14,266 18	1,318 66	1,105 82	7,512 32	130,924 06	4,477 21	187 46	301 15	13,144 06
1913, New Westminster.	56,359 76	29,767 27	5,191 33	13,909 72	2,608 03	1,767 42	10,060 18	119,663 71	4,697 77	131 93	69 13	17,701 00
1913, Essondale. (9 mos.)	35,993 98	17,271 35	2,117 73	9,669 99	208 76	395 80	5,422 23	71,079 84	46,680 54	212 79	.....	14,904 63
1914, New Westminster.	56,381 62	33,204 11	1,455 28	11,758 11	338 03	1,286 68	21,557 62	125,981 45	.....	4,417 50	.....	10,117 16
1914, Essondale	55,364 40	39,873 66	7,585 71	14,168 66	2,026 29	584 23	11,817 49	131,420 44	1,087 31	.....	.....	4,236 37
1915, Essondale	53,392 50	35,225 51	5,287 03	13,942 39	639 67	316 87	15,074 46	123,878 43	841 31	.....	.....	4,628 99
1915, New Westminster.	57,217 21	33,174 90	3,902 49	10,469 03	.....	969 58	17,288 49	123,021 70	1,044 11	.....	.....	5,910 38
1916, New Westminster.	55,501 35	39,294 07	1,349 48	9,696 04	.....	777 94	9,433 33	116,052 21	1,395 09	.....	.....	8,623 88
1916, Essondale	56,515 64	47,601 27	11,242 29	17,066 96	3,154 13	268 96	19,849 12	155,698 37	2,418 80	.....	.....	14,402 82
1917, New Westminster.	55,393 19	38,674 92	5,639 40	9,795.36	.....	1,275 54	13,346 27	124,124 68	1,538 13	.....	.....	3,455 96
1917, Essondale	59,862 30	57,294 25	13,555 03	16,759 02	3,415 42	578 58	14,766 91	166,231 51	1,611 63	.....	.....	10,515 80

TABLE D.

Summary Statement showing the Gross and Net *Per Capita* Cost of Insane Patients to the Province in both Institutions.

Public Hospital for Insane, New Westminster—			
Total maintenance vouchers (12 months)		$127,030 73	
Colony Farm Account, milk, cream, butter, and vegetables		5,862 57	
Mental Hospital Account, milk, butter, eggs, bacon, honey, etc.		478 22	
Mental Hospital Account, cordwood		161 00	
Nursery Account, vegetables		498 60	
Inventory of stock on hand, January 1st, 1917		4,067 13	
		$138,098 25	
Less Tailors' Department Account, clothing to Essondale	$ 5,904 26		
„ Shoemakers' Account, boots, slippers, etc., to Essondale	989 50		
„ live hogs supplied, Essondale	2,090 50		
„ inventory of stock on hand, December 31st, 1917	4,989 66		
		13,973 92	
			$124,124 33
Mental Hospital, Essondale—			
Total maintenance vouchers (12 months)		$154,651 75	
Colony Farm Account, milk, butter, feed, and vegetables		11,023 40	
Nursery Account, fruit, vegetables, and flowers		8,028 89	
City Institution Account, clothing		5,904 26	
„ „ boots and slippers		989 50	
„ „ live hogs supplied		2,090 50	
Inventories, January 1st, 1917, stock, stores, coal, tools, etc.		7,482 88	
„ „ „ 38 hogs, 8,690 lb. at 9c.		782 10	
		$190,863 28	
Less supplies to City Institution (*see* contra)	$ 639 22		
„ board supplied Colony Farm employees, etc.	5,329 92		
„ „ nursery employees	821 25		
„ „ public works employees	2,871 25		
„ inventory, December 31st, 1917, store, wards, tools, etc.	11,392 08		
„ inventory, December 31st, 1917, coal and wood	1,917 50		
„ inventory, December 31st, 1917, 44 hogs, 8,320 lb. at 14c.	1,164 80		
„ supplied to nursery	495 75		
		24,631 77	
			166,231 51
Total net expenditure for both institutions (12 months)			$290,355 84
Less revenue collected and remitted to Treasury—			
Public Hospital for Insane, New Westminster		$21,435 93	
Mental Hospital, Essondale		25,350 09	
			46,786 02
Total net charge to Province of both institutions			$243,569 82

Showing a net yearly *per capita* cost of $194.54, or 53.28 cents daily to the Province.

Revenue.

1873	$1,440 99	1889	$ 220 00	1905	16,613 18
1874	680 00	1890	599 24	1906	19,058 42
1875	1,342 60	1891	761 15	1907	20,753 35
1876	730 31	1892	2,418 43	1908	25,807 83
1877	799 91	1893	1,585 40	1909	25,845 65
1878	479 42	1894	2,709 53	1910	26,137 38
1879	867 38	1895	4,409 23	1911	30,100 20
1880	1,433 04	1896	3,741 71	1912	35,151 97
1881	614 99	1897	3,816 80	1913	40,756 56
1882	505 18	1898	4,003 79	1914	42,731 83
1883	298 24	1899	4,769 04	1915, New West.	18,046 21
1884	98 35	1900	6,893 33	1915, Essondale.	16,329 72
1885	.....	1901	12,800 76	1916, New West.	18,135 91
1886	50 00	1902	10,926 23	1916, Essondale.	21,889 74
1887	720 59	1903	13,639 64	1917, New West.	21,435 93
1888	750 00	1904	$15,004 22	1917, Essondale.	25,350 09

LABORATORY REPORT.

LABORATORY OF PROVINCIAL MENTAL HOSPITAL,
ESSONDALE, B.C., December 31st, 1917.

J. G. McKay, M.D.,
Acting Medical Superintendent, Hospital.

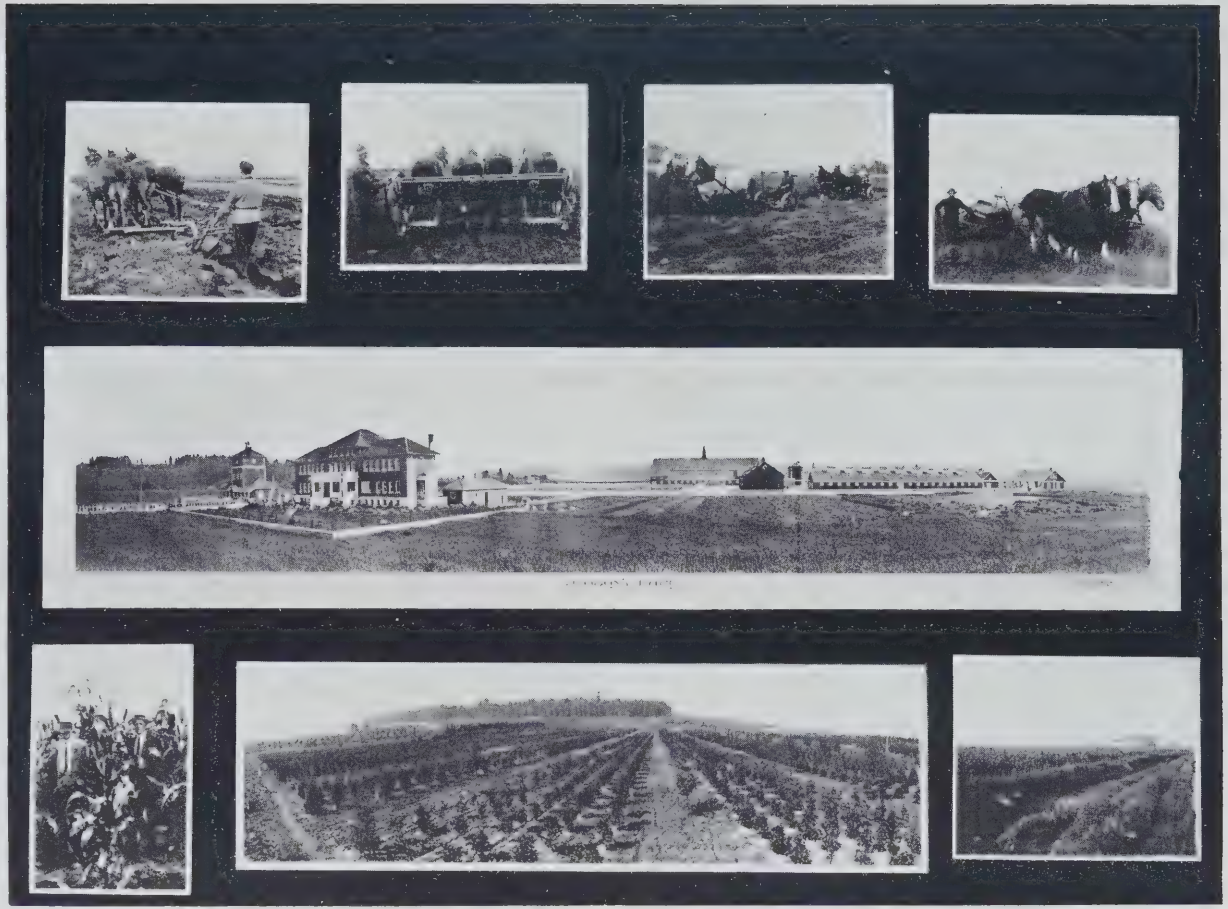
SIR,—I beg to report that the Laboratory was reopened on December 1st, and during the month the following work was accomplished:—

One hundred and ten patients were immunized against typhoid and para-typhoids (*a*) and (*b*) by the use of mixed vaccines of the above bacteria. Media used in bacterial analyses were freshly made up, and also the reagents required for the Wassermann reaction. In addition to this, the routine work carried out was as follows:—

Blood examinations—	
Complete counts	2
For malaria	1
Wassermann test for syphilis	109
Cultures from nose and throat	944
Fluids, pleural	1
Miscellaneous—	
Urinalyses	19
Widal reactions	10
Sections from autopsy and surgical operations	4
Smears—	
From chancre	1
From urethra	2

I have, etc.,

A. L. CREASE,
Assistant Medical Superintendent and Pathologist.



Scenes from Farm and Nursery.

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DENTAL REPORT.

Public Hospital for the Insane,
New Westminster, B.C., January 31st, 1918.

Dr. J. G. McKay,
Acting Medical Superintendent, Public Hospital for the Insane,
New Westminster, B.C.

Sir,—I beg to report the following dental work done on patients in the Mental Hospitals, New Westminster and Essondale, during the year 1917:—

Pyrrhœa treatments	16
Extractions	522
Cleanings	78
Amalgam fillings	113
Synth. porcelain fillings	7
Cement fillings	19
Root fillings	13
Plates	27
Repairs, bridge	2
Repairs, plates	16
Abscesses treated	10

I have, etc.,

Frank P. Smith, D.D.S.

STATISTICAL TABLES.

TABLE No. 1.

Showing the Operations of the Hospitals, New Westminster and Essondale, for the Year 1917, in Summary Form.

Movement of Population.	Male.	Female.	Total.	Total.		
				Male.	Female.	Total.
In residence, New Westminster, December 31st, 1916	209	309	518			
" Essondale, December 31st, 1916	687	..	687			
On probation, carried forward from 1916, New Westminster	18	34	52			
" " " Essondale	15	..	15			
Escaped, carried forward from 1916, New Westminster	4	..	4			
" " Essondale	3	..	3			
				936	343	1,279
Admitted during 1917—						
By ordinary forms	238	124	362			
By urgency forms	5	..	5			
From the Yukon	2	2	4			
				245	126	371
Total under treatment, New Westminster and Essondale, for year 1917.	..	..	..	1,181	469	1,650
Discharged during 1917:						
From New Westminster—						
As recovered	31	38	69			
As improved	10	8	18			
As unimproved	12	15	27			
On probation and still out	9	33	42			
Escaped, but not discharged	8	..	8			
Died	34	26	60			
	104	120	224			
From Essondale—						
As recovered	19	..	19			
As improved	22	..	22			
As unimproved	11	..	11			
On probation and still out	22	..	22			
Escaped, but not discharged	5	..	5			
Died	46	..	46			
	125	..	125			
Total discharged from New Westminster and Essondale	..	..	..	229	120	349
Total in residence, New Westminster and Essondale, December 31st, 1917	..	..	..	952	349	1,301
New Westminster—						
Total on books, December 31st, 1916	231	343	574			
Admissions during 1917	245	126	371			
Returned from Essondale	11	..	11			
				487	469	956
Discharged during 1917	104	120	224			
Transferred to Essondale during 1917	170	..	170			
				274	120	394
Total in residence, New Westminster, December 31st, 1917	..	..	..	213	349	562
Essondale—						
Total on books, December 31st, 1916	705	..	705			
Transferred from New Westminster during 1917	170	..	170			
				875	..	875
Discharged during 1917	125	..	125			
Returned to New Westminster during 1917	11	..	11			
				136	..	136
Total in residence, Essondale, December 31st, 1917	..	..	..	739	..	739
Total in residence, New Westminster, December 31st, 1917	..	..	..	213	349	562
Grand total in residence, New Westminster and Essondale, Dec. 31st, 1917.	..	..	..	952	349	1,301

Daily average population	1,252.01
Maximum number present any one day	1,305.00
Minimum " "	1,204.00
Percentage of discharges on admissions	44.74
" recoveries on admissions	23.72
" deaths on whole number under treatment	6.42

TABLE No. 2.

Showing in Summary Form the Operations of the Hospital since its Inception.

Year.	Admissions.	Discharges.		Deaths.	Number Resident at the Close of each Year.	Increase.	Decrease.	Whole Number treated.	Percentage of Recoveries to Admissions.	Percentage of Discharges to Admissions (Deaths excluded).	Percentage of Deaths to Whole Number under Treatment.
		Recovered.	Not recovered.								
1872	18	1	..	1	16	..	..	18	5.55	5.55	5.55
1873	15	10	2	5	14	..	2	31	66.66	80.00	16.12
1874	12	4	..	3	19	5	..	26	33.33	33.33	11.53
1875	29	3	3	10	32	13	..	48	10.34	26.89	20.83
1876	22	11	3	5	35	3	..	54	50.00	63.63	9.35
1877	14	4	4	3	38	3	..	49	28.57	78.57	6.12
1878	16	7	3	8	36	..	2	54	43.75	62.50	16.16
1879	18	4	1	8	41	5	..	54	22.22	27.77	14.81
1880	17	5	..	5	48	7	..	58	29.41	29.41	8.62
1881	13	5	3	5	48	..	..	61	38.46	61.54	8.19
1882	7	3	1	2	49	1	..	55	42.85	57.14	3.63
1883	8	4	1	3	49	..	..	57	50.00	62.50	5.26
1884	10	2	4	2	51	2	..	59	20.00	60.00	3.33
1885	20	5	..	5	61	10	..	71	25.00	25.00	6.94
1886	27	10	6	6	66	5	..	88	37.03	59.25	6.81
1887	36	15	5	5	77	11	..	102	41.66	55.55	4.80
1888	26	12	6	3	82	5	..	103	46.15	69.23	2.87
1889	41	14	5	4	100	18	..	123	34.15	46.34	3.25
1890	52	17	6	12	117	17	..	152	32.69	44.23	7.64
1891	49	19	4	20	123	6	..	166	38.77	46.94	11.69
1892	52	17	10	13	135	12	..	175	32.69	51.92	6.95
1893	44	14	18	14	133	..	2	179	31.81	72.72	7.60
1894	80	13	19	19	162	29	..	213	16.25	40.00	8.92
1895	62	29	11	20	164	2	..	224	46.77	64.51	8.92
1896	64	23	25	9	171	7	..	228	35.93	75.00	3.94
1897	74	20	8	14	203	32	..	246	27.03	37.83	5.69
1898	81	27	13	19	221	18	..	285	33.33	49.38	6.66
1899	101	31	32	21	234	13	..	327	30.69	62.37	6.42
1900	113	38	27	29	258	24	..	356	33.63	57.52	8.14
1901	115	40	20	25	284	26	..	377	34.78	52.17	6.63
1902	121	30	31	25	311	27	..	413	24.79	50.41	6.06
1903	139	38	37	26	349	38	..	466	27.34	53.96	5.57
1904	115	46	26	26	321	..	28	480	40.00	62.61	5.42
1905	123	43	33	27	348	27	..	505	33.33	61.78	5.34
1906	150	36*	43	28	388	43	..	552	23.03	52.06	5.04
1907	221	48	43	39	461	73	.	666	21.30	41.20	5.08
1908	230	68*	56	57	507	46	..	765	28.30	53.90	7.44
1909	232	73†	77	40	536	29	..	816	31.00	64.60	6.40
1910	280	84	82	41	595	48	..	896	30.00	59.28	4.57
1911	332	67‡	114	60	690	105	..	1,034	19.57	54.42	5.83
1912	375	74*	128	76	752	62	.	1,065	18.90	53.80	7.02
1913	380	90‖	146	67	919	167	..	1,264	22.63	62.10	5.30
1914	402	58	126	74	1,027	108	..	1,364	14.43	45.77	5.43
1915	332	83	91	89	1,090	63	..	1,437	25.00	52.41	6.19
1916	353	73†	96	80	1,205	115	..	1,527	20.68	47.87	5 24
1917	371	88	78	106	1,301	96	..	1,650	23.72	44.74	6.42

* Three not insane. † One not insane. ‡ Two not insane ‖ Four not insane.

TABLE No. 3A.

Showing the Number of Admissions, Discharges, and Deaths during 1917, New Westminster.

Months.	ADMISSIONS.			DISCHARGES.			DEATHS.		
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.
January	24	9	33	2	..	2	2	5	7
February	15	10	25	1	..	1	2	2	4
March	15	13	28	4	15	19	2	1	3
April	22	14	36	1	..	1	2	..	2
May	18	3	21	7	8	15	3	2	5
June	18	14	32	1	2	3	5	2	7
July	24	6	30	7	12	19	2	2	4
August	19	14	33	1	1	2	..	4	4
September	20	8	28	1	..	1	..	2	2
October	23	17	40	2	1	3	3	3	6
November	26	7	33	1	..	1	4	1	5
December	21	11	32	25	22	47	9	2	11
Totals	245	126	371	53	61	114	34	26	60

TABLE No. 3B.

Showing Number of Admissions, Discharges, and Deaths during 1917, Essondale.

Months.	Admissions, Males only.	Discharges, Males only.	Deaths, Males only.
January	21	1	6
February	12	..	..
March	12	1	5
April	17	12	6
May	12	4	3
June	6	6	5
July	19	1	6
August	13	..	2
September	15	..	1
October	17	..	7
November	19	22	2
December	7	5	3
Totals	170	52	46

TABLE No. 4.

Showing the Civil State of Patients admitted during 1917.

Civil State.	Male.	Female.	Total.
Single	163	32	195
Married	69	85	154
Widowed	12	9	21
Divorced	1	..	1
Totals	245	126	371

TABLE No. 5.

Showing the Religious Denominations of those admitted during 1917.

Religious Denomination.	Male.	Female.	Total.
Agnostic	1	..	1
Atheist	1	..	1
Confucian	10	..	10
Greek	6	..	6
Hebrew	1	2	3
Hindu	4	..	4
Protestant, various denominations	160	98	258
Roman Catholic	54	20	74
Shinto	3	..	3
Unknown	2	1	3
No religion	3	5	8
Totals	245	126	371

TABLE No. 6.

Showing the Degree of Education of those admitted during 1917.

Degree of Education.	Male.	Female.	Total.
Superior	11	5	16
Common school	206	102	308
Very little	13	5	18
None	14	13	27
Unknown	1	1	2
Totals	245	126	371

TABLE No. 7.

Showing the Nationality of those admitted during 1917.

Nationality.	Male.	Female.	Total.
Alsace	..	1	1
Australia	2	..	2
Austria	12	..	12
Barbados	1	..	1
Bavaria	1	..	1
China	11	..	11
Denmark	4	2	6
England	58	42	100
Finland	4	3	7
France	..	1	1
Germany	9	1	10
Hungary	1	..	1
India	5	..	5
Ireland	9	7	16
Italy	9	4	13
Japan	3	..	3
Newfoundland	1	1	2
Norway	7	1	8
Poland	1	..	1
Russia	2	..	2
Scotland	18	8	26
South Africa	..	1	1
Sweden	4	1	5
Syria	..	1	1
United States	18	12	30
Wales	2	..	2
Yukon	..	1	1
Unknown	..	2	2
Canada—			
Alberta	1	..	1
British Columbia	19	13	32
Manitoba	3	4	7
New Brunswick	6	2	8
Nova Scotia	5	3	8
Ontario	20	9	29
Prince Edward Island	3	1	4
Quebec	6	5	11
Totals	245	126	371

TABLE No. 8.

Showing what Districts contributed Patients during 1917.

Place of Residence at Time of Committal.	Male.	Female.	Total.
Agassiz	1	..	1
Alberni	1	..	1
Alert Bay	1	..	1
Alice Arm	1	..	1
Anyox	..	1	1
Ashcroft	1	..	1
Burnaby	..	2	2
Burquitlam	1	..	1
Bridesville	2	..	2
Calgary, Alta.	..	2	2
Campbell River	..	1	1
Chilliwack	1	2	3
Clinton	1	..	1
Collingwood	1	1	2
Colquitz	1	..	1
Cowichan	1	1	2
Cumberland	1	..	1
Dawson, Y.T.	1	..	1
Deep Bay	1	..	1
Duncan	2	..	2
East Burnaby	..	1	1
Edgewood	1	..	1
Edmonds	1	..	1
Enderby	1	..	1
Esquimalt	3	1	4
Excelsior Creek, Y.T.	..	1	1
Fernie	1	..	1
Fort St. James	1	..	1
Fraser Mills	2	..	2
Gabriola Island	1	..	1
Golden	1	..	1
Granby	1	..	1
Granby Bay	1	..	1
Grand Forks	2	..	2
Greenwood	2	..	2
Harriet Bay	1	..	1
Hedley	1	..	1
Inisfree, Alta.	..	1	1
James Island	..	1	1
Kamloops	5	1	6
Kaslo	..	1	1
Kelowna	1	1	2
Ladner	2	..	2
Ladysmith	2	1	3
Langley	1	..	1
Lawn Hill	1	..	1
Lulu Island	1	1	2
Lund	1	..	1
Mara Lake	1	..	1
Matsqui	1	..	1
Merritt	2	..	2
Mission City	2	1	3
Morgan Creek	..	1	1
Morrissey	3	..	3
Mount Tolmie	1	..	1
Nanaimo	1	2	3
Nelson	6	2	8
New Westminster	9	4	13
Nicola	1	..	1
North Vancouver	4	5	9
Ocean Falls	1	..	1
150-Mile House	1	..	1
Parksville	..	1	1
Pemberton Meadows Reserve	..	1	1

TABLE No. 8—*Concluded.*

Place of Residence at Time of Committal.	Male.	Female.	Total.
Penticton	1	1	2
Point Grey	1	2	3
Port Moody	1	..	1
Port Stanley, Ont.	1	..	1
Prince Rupert	4	..	4
Princeton	2	..	2
Quatsino	1	..	1
Revelstoke	3	2	5
Riska Creek	1	..	1
Rossland	1	2	3
Royal Oak	1	..	1
Ruskin	1	..	1
Salmon Arm	1	..	1
Saanich	2	4	6
Savona	..	1	1
Selkirk, Y.T.	..	1	1
Sidney	1	..	1
South Vancouver	5	6	11
South Wellington	1	..	1
Stark Falls	1	..	1
Stevesville, Alta.	1	..	1
Sullivan	1	..	1
Terrace	..	1	1
Trail	2	..	2
Ucluelet	1	..	1
Vancouver	94	53	147
Vernon	4	..	4
Victoria	26	15	41
Wasa	1	..	1
White Horse, Y.T.	1	1	2
Totals	245	126	371

Mental Hospital, Essondale.

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Table No. 9.

Showing the Occupations of those admitted during 1917.

Occupation.	Male.	Female.	Total.
Accountant	2	..	2
Agent	3	1	4
Apprentice	1	..	1
Architect	2	..	2
Baker	3	..	3
Barber	1	..	1
Barrister	1	..	1
Bar-tender	1	..	1
Blacksmith	6	..	6
Book-keeper	1	1	2
Broker	1	..	1
Butcher	1	..	1
Carpenter	6	..	6
Chef	1	..	1
Clerk	7	..	7
Collector	1	..	1
Contractor	1	..	1
Cook	2	..	2
Cruiser	1	..	1
Domestic	..	7	7
Draper	1	..	1
Dressmaker	..	1	1
Druggist	1	..	1
Electrician	3	..	3
Engineer	6	..	6
Farmer	12	..	12
Fireman	3	..	3
Foreman	1	..	1
Gardener	1	..	1
Grocer	1	..	1
Housekeeper	..	9	9
Housewife	..	86	86
Interpreter	1	..	1
Janitor	1	..	1
Journalist	..	1	1
Junk-dealer	1	..	1
Labourer	94	..	94
Logger	9	..	9
Longshoreman	1	..	1
Machinist	2	..	2
Merchant	3	..	3
Miner	15	..	15
Nurse	..	1	1
Painter	1	..	1
Physician	1	..	1
Plumber	1	..	1
Rancher	11	..	11
Rug-weaver	1	..	1
Sailor	4	..	4
Shoemaker	1	..	1
Sign-writer	1	..	1
Smelterman	2	..	2
Steam-fitter	1	..	1
Stoker	1	..	1
Stone-cutter	1	..	1
Storekeeper	1	..	1
Student	..	1	1
Tailor	2	..	2
Teacher	1	2	3
Teamster	1	..	1
No occupation	16	16	32
Totals	245	126	371

TABLE No. 10.

Showing the Age of those admitted during 1917.

Age.	Male.	Female.	Total.
Under 15 years	4	3	7
From 15 to 20 years	12	3	15
" 20 to 25 "	19	8	27
" 25 to 30 "	19	10	29
" 30 to 35 "	40	18	58
" 35 to 40 "	42	22	64
" 40 to 45 "	33	16	49
" 45 to 50 "	23	9	32
" 50 to 55 "	16	19	35
" 55 to 60 "	10	4	14
" 60 to 65 "	9	4	13
" 65 to 70 "	9	6	15
" 70 to 75 "	5	3	8
" 75 to 80 "	1	1	2
Over 80 years	3	..	3
Totals	245	126	371

TABLE No. 11.

Showing the Number of Attacks in those admitted during 1917.

Number of Attacks.	Male.	Female.	Total.
First	194	97	291
Second	39	24	63
Third	6	4	10
Fifth	1	..	1
Several	1	1	2
Unknown	4	..	4
Totals	245	126	371

TABLE No. 12.

Showing the Alleged Duration of Attack prior to Admission.

Duration of Attack.	Male.	Female.	Total.
Under 1 week	30	15	45
From 1 " to 1 month	84	45	129
" 1 to 3 months	36	24	60
" 3 to 6 "	15	9	24
" 6 to 12 "	13	2	15
" 1 to 2 years	13	4	17
" 2 to 5 "	3	6	9
" 5 to 10 "	4	4	8
" 10 to 15 "	3	2	5
Over 15 years	10	6	16
Unknown	34	9	43
Totals	245	126	371

TABLE No. 13.

Showing Statistics of Heredity in those admitted during 1917.

Heredity.	Male.	Female.	Total.
Paternal branch	17	6	23
Maternal branch	9	12	21
Lateral branches	12	11	23
Heredity, inferred	8	3	11
Unknown	199	94	293
Totals	245	126	371

TABLE No. 14.

Showing the Alleged Exciting Cause of Attack of Insanity in those admitted during 1917.

Alleged Cause.	Male.	Female.	Total.
Alcohol	18	4	22
Arteriosclerosis	2	1	3
Cardiorenal disease	1	..	1
Cerebral embolism	..	2	2
Drugs	3	1	4
Epilepsy	6	..	6
Hemiplegia	..	1	1
Heredity, ascertained	38	29	67
Heredity, inferred	8	3	11
Menopause	..	3	3
Old age	21	11	32
Overstudy	..	1	1
Pregnancy	..	1	1
Seclusion	4	..	4
Strain of military service	1	..	1
Syphilis	23	8	31
Traumatic	3	1	4
Worry	2	2	4
Unknown	115	58	173
Totals	245	126	371

TABLE No. 15.

Showing the State of Bodily Health of those admitted during 1917.

Bodily Condition.	Male.	Female.	Total.
In average bodily health	218	91	309
In reduced health	21	31	52
In greatly reduced health	6	4	10
Totals	245	126	371

TABLE No. 16.

Showing the Form of Mental Disorder in those admitted during 1917.

Form of Disorder.	Male.	Female.	Total.
Arteriosclerotic hallucinosis	1	..	1
Cerebral syphilis	1	1	2
Dementia præcox	59	23	82
Epileptic insanity	7	..	7
General paresis	20	6	26
Idiocy and imbecility	14	12	26
Mania, acute	1	1	2
Mania, depressive condition	80	52	132
Melancholia	1	1	2
Paranoia	11	9	20
Senile dementia	25	11	36
Terminal dementia	3	..	3
Toxic insanity	21	10	31
Traumatic insanity	1	..	1
Totals	245	126	371

TABLE No. 17A.

Showing the Number allowed out on Probation and Results during 1917, New Westminster.

Results.	Male.	Female.	Total.
Discharged recovered	19	18	37
" improved	4	3	7
" unimproved	5	6	11
Returned to Hospital	3	13	16
Still out at close of year	9	32	41
Totals	40	72	112

TABLE No. 17B.

Showing the Number allowed out on Probation and Results during 1917, Essondale.

Results.	Males only.
Discharged recovered	11
" improved	11
" unimproved	3
Returned to Hospital	1
Still out at close of year	22
Total	48

TABLE No. 18A.

Showing the Alleged Duration of Insanity prior to Admission in those discharged from New Westminster during 1917.

Duration of Insanity.	Male.	Female.	Total.
Less than 1 week	10	7	17
" 1 month	10	17	27
From 1 to 2 months	6	9	15
" 2 to 3 "	..	2	2
" 3 to 6 "	1	3	4
" 6 to 12 "	3	2	5
" 1 to 2 years	3	1	4
" 2 to 3 "	1	2	3
Over 3 years	1	3	4
Unknown	18	15	33
Totals	53	61	114

TABLE No. 18B.

Showing the Alleged Duration of Insanity prior to Admission in those discharged from Essondale during 1917.

Duration of Insanity.	Males only.
Less than 1 week	11
" 1 month	12
From 1 to 2 months	9
" 3 " 6 "	4
" 1 " 2 years	1
Unknown	15
Total	52

TABLE No. 19A.

Showing the Length of Residence of those who were discharged from New Westminster during 1917.

Length of Residence.	Discharged recovered.	Discharged improved.	Discharged unimproved.
Less than 1 month	11	2	9
From 1 to 2 months	12	2	3
" 2 " 3 "	12	1	5
" 3 " 4 "	5	3	2
" 4 " 5 "	6	1	..
" 5 " 6 "	2	1	2
" 6 " 9 "	8	3	2
" 9 " 12 "	5	3	..
" 1 " 2 years	4	1	1
" 2 " 3 "	1	..	3
" 3 " 4 "	1	..	..
" 4 " 5 "	1	..	..
" 5 " 6 "	..	1	..
" 9 " 10 "	1	..	..
Totals	69	18	27

TABLE No. 19B.

Showing the Length of Residence of those who were discharged from Essondale during 1917.

Length of Residence.	Discharged recovered.	Discharged improved.	Discharged unimproved.
From 1 to 2 months	1	4	2
" 3 " 4 "	3	5	4
" 5 " 6 "	2	..	..
" 6 " 9 "	4	3	1
" 9 " 12 "	2	2	..
" 1 " 2 years	4	4	..
" 2 " 3 "	2	2	2
" 3 " 4 "	..	1	..
" 4 " 5 "	..	1	2
" 7 " 8 "	1	..	..
Over 8 years	..	..	..
Totals	19	22	11

TABLE No. 20A.

Records of Deaths for the Year 1917, New Westminster.

Register No.	Initials.	Sex.	Age.	Time in Hospital.			Certified Cause.
				Years.	Months.	Days.	
4987	T. P.	M.	72	..	..	6	Cerebral embolism.
4625	R. J. M.	F.	30	1	..	27	General paresis.
1558	E. M.	F.	47	12	3	3	Status epilepticus.
3938	E. C.	F.	69	2	11	17	Exhaustion of senile dementia.
2877	E. T.	F.	62	5	10	14	Endocarditis and myocarditis.
5019	M. H.	F.	69	..	..	7	Exhaustion of senile dementia.
4784	E. B.	M.	6	..	8	12	Pulmonary tuberculosis.
4388	C. R. S.	F.	46	1	10	27	General paresis.
3081	P. W.	M.	48	6	1	9	Pulmonary tuberculosis.
4731	C. A. B.	F.	87	..	10	24	Exhaustion of senile dementia.
4919	F. N. P.	M.	16	..	4	26	Insufflation suffocation.
4856	J. K.	M.	44	..	7	24	Pernicious anæmia.
5037	E. R.	M.	23	..	1	17	Exhaustion of acute mania.
4375	E. M. G.	F.	65	2	..	25	General paresis.
5093	A. A.	M.	36	..	..	12	Cerebral tuberculosis.
5102	J. A.	M.	74	..	..	5	Bronchopneumonia.
5106	M. G. H.	F.	39	..	..	21	General paresis.
3654	R. E.	M.	37	4	..	24	Pulmonary tuberculosis.
1662	K. C.	M.	59	11	9	5	Exhaustion of epileptic dementia.
5131	E. L. C.	M.	39	..	..	7	General paresis.
3122	A. H.	F.	75	5	6	1	Gangrene.
4298	T. S. B.	M.	24	2	5	16	Uremia.
4240	A. J. D.	F.	74	2	7	25	Exhaustion of senile dementia.
4457	R. H. B.	M.	45	2	1	3	Strangulation.
5077	F. B.	M.	55	..	2	27	Œdema of lungs.
5022	D. McD.	M.	39	..	5	..	Exhaustion of acute mania.
4677	H. G.	F.	12	1	4	17	Toxic absorption.
5034	J. A.	M.	81	..	4	19	Exhaustion of senile dementia.
3457	N. E.	F.	43	4	8	23	General paresis.
3238	H. H.	M.	59	5	3	16	Cerebral hæmorrhage.
4972	M. L. V. K.	F.	33	..	7	12	General paresis.
3462	D. L.	M.	69	4	9	5	Exhaustion of epileptic dementia.
5186	L. B.	F.	48	..	..	14	General paresis.
4471	C. D.	F.	38	2	2	10	Pulmonary tuberculosis.
4904	C. C.	F.	41	..	11	9	General paresis.
4213	N. K. P.	F.	31	2	11	10	Pulmonary tuberculosis.
5050	N. H. J.	F.	16	..	6	15	Exhaustion of idiocy.
5148	M. R. L. H.	F.	33	..	3	19	Exhaustion of inanition.
4866	B. B. H.	M.	37	1	2	13	General paresis.
5230	N. J. Q.	F.	40	..	1	9	Exhaustion of manic depressive insanity.
5039	M. B.	F.	72	..	8	4	Myocarditis.
245	O. N.	M.	80	30	6	13	Pulmonary infarction.
4662	G. W. O.	M.	46	1	8	29	General paresis.
5156	S. F.	F.	65	..	4	10	Cerebral hæmorrhage.
5192	J. R. R.	M.	34	..	3	10	Cerebral syphilis.
4966	O. G.	M.	36	..	11	7	General paresis.
5316	D. McP.	M.	55	..	.	3	Gumma of the cerebrum.
4735	L. C. R.	F.	17	1	7	21	Exhaustion of imbecility.
5241	J. B. M.	M.	50	..	2	21	Exhaustion of acute mania.
4900	F. G.	M.	71	1	4	23	Diabetic furunculosis.
5196	L. M. S.	F.	42	..	4	7	Exhaustion of acute mania.
4482	C. J. K.	M.	36	2	6	3	General paresis.
4862	E. B.	M.	7	1	4	17	Exhaustion of idiocy.
3143	L. C.	F.	37	5	11	17	Abscess of liver.
4675	J. W. A.	M.	42	1	10	2	General paresis.
5325	J. F.	M.	30	..	..	14	Streptococcic septicæmia.
4955	J. A. F.	M.	62	1	..	27	Exhaustion of senile dementia.
5261	C. W.	M.	18	..	2	16	Acute dilatation of stomach.
5359	W. J. F.	M.	46	..	..	3	Ulceration of intestines (sigmoid).
1367	P. L.	M.	42	14	9	9	Pulmonary tuberculosis.

TABLE No. 20B.

Record of Deaths for the Year 1917, Essondale.

Register No.	Initials.	Sex.	Age.	Time in Hospital.			Certified Cause.
				Years.	Months.	Days.	
1394	H. T.	M.	65	12	6	4	Myocarditis.
3042	F. C.	M.	76	5	4	..	Bronchopneumonia.
4476	P. B.	M.	78	1	6	15	Sarcoma of jaw.
4155	R. W.	M.	36	2	5	18	Tubercular peritonitis.
2426	A. B. McK.	M.	62	6	6	6	Chronic nephritis.
3027	J. E.	M.	25	5	5	8	Pulmonary tuberculosis.
4803	H. S.	M.	47	..	9	..	Cerebral hæmorrhage.
4796	S. B.	M.	61	..	9	13	Chronic nephritis.
4778	A. N. W.	M.	71	..	9	7	Bipneumonia and infected arm.
4762	A. A. G.	M.	50	..	11	..	Bronchopneumonia.
4351	A. D.	M.	35	2	1	11	Pulmonary tuberculosis.
330	A. C.	M.	80	27	10	14	Cirrhosis of liver.
4756	C. P.	M.	41	..	11	17	Cerebral hæmorrhage.
4912	J. B.	M.	78	..	6	14	Gastro-enteritis.
4599	W. B.	M.	41	1	5	25	General paresis.
3021	C. M. C.	M.	33	5	8	10	Bronchopneumonia.
4434	J. M. T.	M.	47	2	..	4	Pulmonary tuberculosis.
4315	H. R. S.	M.	41	2	3	29	Exhaustion of general paresis.
4739	M. W.	M.	84	1	1	24	Myocarditis.
4777	G. G.	M.	61	1	..	11	Cerebral hæmorrhage.
5064	F. S. B. C.	M.	53	..	2	22	Cerebral hæmorrhage.
4093	R. M.	M.	70	3	..	..	Cerebral hæmorrhage.
5038	J. P. E.	M.	67	..	4	4	Chronic nephritis.
4712	S. L.	M.	40	1	3	12	Chronic nephritis.
3752	W. M.	M.	53	3	11	29	Pneumonia.
3770	H. D.	M.	37	3	10	21	Cerebral hæmorrhage.
3853	J. V.	M.	39	3	9	9	Cerebral hæmorrhage.
5123	G. K.	M.	24	..	2	18	Pulmonary tuberculosis.
292	C. Y.	M.	80	29	5	11	Exhaustion of terminal dementia.
4340	J. B.	M.	53	2	5	18	Cerebral hæmorrhage.
3912	C. D.	M.	45	3	7	23	Carcinoma of liver.
4780	G. E. M.	M.	38	1	2	18	Lobar pneumonia.
5089	T. C. R. C.	M.	37	..	4	16	Cerebral hæmorrhage.
82	W. B.	M.	70	41	4	10	Gastro-enteritis.
4098	J. S. C.	M.	24	3	3	21	Pulmonary tuberculosis.
3218	J. McT.	M.	60	5	6	26	Exhaustion of senile dementia.
204	T. B.	M.	74	31	11	14	Myocarditis.
3241	R. E. W.	M.	29	5	6	19	Typhoid.
2810	W. M.	M.	65	6	10	7	Exhaustion of senile dementia.
4530	V. R. K.	M.	34	2	2	14	Endocarditis.
4143	O. R.	M.	18	3	3	8	Pulmonary tuberculosis.
5095	D. L. T.	M.	40	7	..	..	Exhaustion of general paralysis.
4172	W. S.	M.	81	3	3	10	Pneumonia.
3781	K. L. B.	M.	Unk'n	4	4	..	Cerebral hæmorrhage.
5176	O. E. M.	M.	66	..	5	15	Exhaustion of dementia præcox.
4763	J. E.	M.	39	1	8	..	Cerebral hæmorrhage.

Dormitory, New Mental Hospital, Essondale.

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Table No. 21a.

Showing Work done by Patients during the Year 1917 at New Westminster.

Work done by Patients.	Days.
Auto-truck	365
Baker	930
Carpenter	632
Chicken-house	426
Dining-room	3,793
Engineer	730
Farmer	8,285
Florist	329
Gardener	4,035
Gate	357
Kitchen	2,646
Laboratory	365
Laundry	2,393
Lawns	1,558
Painter	744
Piggery	1,460
Plasterer	131
Plumber	310
Porter	760
Scullery	1,154
Shoemaker	757
Tailor	297
Teamster	313
Ward-work	22,003

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TABLE No. 21B.

Labour of Patients under the Direction of the Grounds Overseer at Essondale during the Year 1917—

	Days.
Blacksmith-shop	300
Boundary stone fence	727
Boiler-room and coal-bunkers	286
Clearing land	765
Chicken-yard	366
Chores	808
Cement-work and building	1,903
Colony Farm	146
Cutting wood	265
Ditches and drains	677
Dykes—	
River-work	1,638
Mattress-work	935
Pile-driving and donkey	643
Field-work	631
Fencing	272
Grading grounds	301
Gardens	2,368
Lawns (grass-cutting)	1,495
Manure	308
Miscellaneous	2,490
Nursery	817
New laundry	2,129
Piggery	1,249
Roads	368
Root-house	1,061
Tool-house	311
Teaming	570
Total	23,832

Labour of Patients in Various Departments at Essondale during 1917—

Bake-shop	466
Billiard-room and basement	4,874
Carpenter	780
Dining-room	5,742
Engineer	1,810
Kitchen	1,364
Laundry	5,940
Painter	813
Plasterer	1,475
Plumber	418
Parole patients' work	1,242
Scullery	1,458
Tailor-shop	223
Total	26,605

Labour of Patients at Colony Farm, Essondale, during the Year 1917—

Arena	720
Carpenter-shop	260
Dining-room	1,460
Farm Superintendent's house	362
Carried forward	2,802

TABLE No. 21B—*Concluded.*

	Days.
Brought forward	2,802
Farm (including fields, roads, stables, barns, and dairy)	11,281
General	705
Gardens	577
Kitchen	730
Fireman	1,095
Ward-work	1,825
Total	19,015

TABLE No. 22.

Articles made by Female Patients, 1917.

Aprons	266	Pillow-slips	632
Chemises	247	Sheets	787
Clothes-bags	6	Surgeons' gowns	6
Covers, bureau	38	Skirts	6
Curtains, pairs	41	Table-cloths	53
Dresses, gingham	117	Towels, bath	321
„ night	18	„ hand	40
Handkerchiefs	240	„ roller	306
Neckties	336	„ tea	236
Napkins, table	12	„ tray	107

Articles made for Nurses.

Aprons	117	Cuffs, pairs	74
Caps	33	Dresses	45

Mending done for Nurses.

Aprons	271	Cuffs	8
Caps	7	Dresses	173

Mending done for Female Patients.

Aprons	279	Pillow-slips	178
Blankets, canvas	96	Sheets	466
„ wool	253	Skirts	1,637
Blouses	178	Spreads, bed	178
Chemises	927	Table-cloths	196
Drawers	1,447	Towels, bath	85
Dresses, gingham	1,194	„ roller	61
„ night	1,030	Ticks, bed	135
„ serge	705	Vests, under	1,275
Hose	11,368		

Mending done for Male Patients.

Aprons	199	Socks, pairs	16,506
Blankets, wool	175	Spreads, bed	276
Coats, white	20	Sweaters	29
Drawers	2,968	Table-cloths	271
Pillow-slips	45	Towels, bath	68
Sheets	787	„ roller	47
Shirts, over	4,737	Ticks, bed	102
„ under	3,805	„ pillow	5

TABLE No. 22—*Continued.*

Articles made for Essondale, 1917.

Aprons, kitchen	75	Caps	10
„ for cooks	18	Table-cloths	65

Fruit put up in 1917.

Cherries	20 quarts.
Currants, black	25 „
„ red	35 „
Crab-apples	80 „
Pears	50 „
Plums	60 „
Rhubarb	125 „
Raspberry	45 „
Strawberry	138 „

Pickles put up in 1917.

Pears	20 quarts.
Tomatoes	90 „

Tailor's Report for 1917.

Uniforms made for New Westminster—		
49 suits	$1,385 00	
39 pairs of pants	298 80	
		$1,683 80
Stock—		
48 suits	$ 702 00	
46 coats	208 00	
20 vests	64 00	
61 pairs of pants	232 00	
1 camisole	3 00	
8 canvas blankets	33 40	
38 bed-ticks	66 40	
16 pillow-ticks	5 60	
		1,314 40
Repairs—		
132 coats	$ 72 80	
442 pairs of pants	110 50	
75 vests	18 75	
		202 05
Miscellaneous work		25 00
Total, New Westminster		$3,225 25
Uniforms made for Essondale—		
72 suits	$2,640 00	
53 pairs of pants	379 00	
		$3,019 00
Stock—		
133 suits	$1,784 00	
9 pairs of pants	34 00	
10 canvas blankets	40 00	
2 camisoles	7 00	
		1,865 00
Carried forward		$4,884 00

TABLE No. 22—*Continued.*

Brought forward		$4,884 00
Repairs—		
866 coats	$ 346 40	
1,908 pairs of pants	477 00	
555 vests	138 75	
19 canvas blankets	9 75	
16 camisoles	2 00	
		973 90
Miscellaneous—		
Work	$ 3 25	
69½ yards lining at 27½ cents	19 11	
20 yards lining at $1.20	24 00	
		46 36
Total, Essondale		$5,904 26
Grand total		$9,129 51

Statement, Tailor-shop, Year 1917.

Debits—		
January 1st, 1917, stock on hand		$ 967 93
Goods purchased, tweeds, serges, etc.		5,257 84
Salaries—		
Mr. Beggs	$ 945 60	
Mr. French	900 00	
Mrs. Huntley	540 00	
Miss Derby	240 00	
Miss Pennington	234 00	
Mrs. Black	49 00	
		2,908 00
Power, electric	$ 106 77	
Light, electric	18 00	
Repairs, Singer Machine Co.	26 01	
		150 78
Total		$9,284 55
Credits—		
Clothing, etc., to Essondale	$5,904 26	
Clothing, etc., to New Westminster	3,225 25	
Sales of cuttings (rags)	38 00	
Stock on hand, December 31st, 1917	766 10	
		9,933 61
Credit balance		$ 649 06

Shoemaker's Report for 1917.

New work for house and stock—		
59 pairs of men's boots	$ 410 00	
449 „ „ slippers	1,063 00	
5 „ „ mocassins	10 00	
27½ „ special shoes	89 00	
Carried forward	$1,572 00	

TABLE No. 22—*Concluded.*

Brought forward	$1,572 00	
Repairs for New Westminster—		
180 pairs of men's boots	234 50	
25 „ „ slippers	26 50	
110 „ women's shoes	100 75	
Repairs for Essondale—		
448 pairs of men's boots	647 25	
306 „ „ slippers	205 65	
Miscellaneous	15 00	
Total	$2,801 65	

HOME FARM PRODUCE, 1917 (NEW WESTMINSTER).

Hogs sold alive, 66, value	$1,612 20	
Pork shipped alive to Essondale, 14,610 lb. at 14 cents	2,045 40	
Pork dressed and supplied to Essondale, 205 lb. at 22 cents	45 10	
Pork dressed and supplied to New Westminster, 13,193 lb. at 22 cents	2,902 46	
		$6,605 16
Hogs on hand—		
23 sows, value	$ 920 00	
13 young sows, value	455 00	
4 boars, value	165 00	
27 hogs, average 200 lb. at 15 cents	510 00	
56 hogs, average 70 lb. at 15 cents	588 00	
61 pigs at $8 each	488 00	
		3,126 00
Total		$9,731 16
Stock on hand, January 1st, 1917, 170 hogs, value	$2,650 00	
Cost of feed, etc., during 1917	2,657 25	
Half-salary of farmer apportioned	447 50	
		5,754 75
Total profit on piggery for 1917		$3,976 41

POULTRY REPORT, 1917 (NEW WESTMINSTER).

Eggs supplied to the institution, 844 doz. at 45 cents	$ 379 80	
Ducks, dressed, 60 at $1.50	90 00	
Chickens, dressed, 56 at $1.25	70 00	
		$ 539 00
Stock on hand—		
13 ducks at $1.50	$ 19 50	
100 chickens at $1	100 00	
180 pullets and hens at $1.50	270 00	
		389 50
Total		$ 929 30
Stock on hand, January 1st, 1917—		
130 chickens at $1	$ 130 00	
18 ducks at $1.50	27 00	
Feed for poultry during 1917	416 45	
Quarter-salary of farmer apportioned	223 75	
		797 20
Total profit on poultry for 1917		$ 132 10
Total profit on piggery for 1917		3,976 41
Total profit on home farm		$4,108 51

GARDEN PRODUCE, 1917 (NEW WESTMINSTER).

Credits—					
	Vegetables.				
Green onions	475	lb.	at 3c.	$ 14	25
Cooking-onions	1,755	„	„ 4c.	70	20
Vegetable marrows	426	„	„ 2c.	8	52
Pumpkin	1,120	„	„ 2c.	22	50
Ripe tomatoes	40	„	„ 10c.	4	00
Green tomatoes	570	„	„ 7c.	39	90
Horse-radish	98	„	„ 10c.	9	80
Early potatoes	2,250	„	„ 3c.	67	50
Late potatoes	2,700	„	„ 1½c.	40	50
Peas	655	„	„ 10c.	65	50
Asparagus	210	„	„ 10c.	21	00
Carrots	22,720	„	„ 1½c.	340	80
Spinach	3,865	„	„ 10c.	386	50
Turnips	1,200	„	„ 1½c.	18	00
Beets	9,000	„	„ 1½c.	135	00
Cabbage	14,460	„	„ 2c.	289	20
String beans	625	„	„ 10c.	62	50
Celery	950	heads	„ 5c.	47	50
Parsley	280	bunches	„ 5c.	14	00
Radish	78	„	„ 5c.	2	34
Lettuce	369	dozen	„ 25c.	92	25
Sweet corn	397	„	„ 20c.	79	40
Cucumbers	370		„ 2c.	7	40
Estimated total value of vegetables				$1,838	56
Credits—	*Fruits.*				
Apples	29,640	lb.	at 3c.	$ 889	20
Strawberries	2,570	„	„ 10c.	257	00
Raspberries	874	„	„ 10c.	87	40
Gooseberries	69	„	„ 10c.	6	90
Red currants	1,417	„	„ 10c.	141	70
Black currants	94	„	„ 12c.	11	28
Blackberries	9	„	„ 10c.		90
Rhubarb	5,865	„	„ 5c.	293	25
Pears	1,900	„	„ 3c.	57	00
Cherries	742	„	„ 10c.	74	20
Prunes	860	„	„ 3c.	25	80
Plums	1,175	„	„ 4c.	47	00
Apples sent to Essondale	2,650	„	„ 3c.	79	50
Estimated total value of fruit				$1,971	13
„ „ vegetables				1,838	56
Total				$3,809	69
Debits—					
Water used				$	28 53
Quarter-year salary, one man at $895					223 75
1 doz. farming implements					31 50
1 bbl. lime spray, 42 gals.					16 80
54 apple, pear, plum, and cherry trees					26 55
1 month, team, ploughing, manuring, harrowing, and hauling					50 00
1 month salary, teamster					55 00
Total				$	432 13
Credits total				$3,809	69
Debits total				432	13
Profit				$3,377	56

GREENHOUSE.

Bedding Plants grown, 1917.

Credits—	
13,707 plants at 10c. each	$1,370 70
7,230 „ 5c. „	361 50
13,140 „ 2c. „	262 80
Sent to Essondale and Colony Farm	150 50
Estimated value	$2,145 50

Cut Flowers under Glass.

Credits—	
Cut flowers	450 00
Total	$2,595 50
Debits—	
Coal used in boiler-room in greenhouse, 1917	$ 274 80
Water used during 1917	60 59
Salaries, 1917, two men	1,404 00
Total	$1,749 39
Credits during 1917	$4,741 00
Debits during 1917	1,749 39
Total profit for year 1917	$2,991 61

POULTRY STATEMENT, 1917 (ESSONDALE).

Receipts.

Eggs supplied Mental Hospital during 1917, 3,491 doz. at 35c.	$1,221 85
Live birds supplied New Westminster	44 70
Dressed fowl supplied Mental Hospital, 1917, 1,575 lb. at 30c.	472 50
Poultry stock on hand, December 31st, 1917	1,204 45
Feed stock on hand, December 31st, 1917	41 25
Total	$2,984 75

Disbursements.

Stock on hand, January 1st, 1917	$ 933 75
Feed supplied by Colony Farm during 1917	125 58
Horse-labour supplied by Colony Farm, 1917	107 71
Feed purchased	925 90
Wages	450 00
Balance (being profit)	441 81
Total	$2,984 75

PIGGERY STATEMENT, 1917 (ESSONDALE).

Receipts.

Dressed pork supplied to Mental Hospital, Essondale, during 1917, 18,110½ lb. at 22c.	$3,984 31
Live hogs supplied to Mental Hospital, 1917, 3,115 lb. at 14c.	436 10
Live hogs on hand, December 31st, 1917, 44 head—8,320 lb. at 14c.	1,164 80
Total	$5,585 21

Patients' Day-room, New Mental Hospital, Essondale. (West Wing.)

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Disbursements.

Hogs on hand, January 1st, 1917, 38 head—8,670 lb. at 9c.	$ 782 10
Feed supplied by Colony Farm during 1917	89 71
Feed purchased	44 65
Horse-labour supplied by Colony Farm	203 60
Live hogs supplied by New Westminster during 1917, 14,610 lb. at 14c.	2,045 40
Dressed pork supplied by New Westminster, 205 lb. at 22c.	45 10
Wages	450 00
Balance (being profit)	1,924 65
Total	$5,585 21

TREES AND SHRUBS SHIPPED FROM NURSERY, ESSONDALE, DURING 1917.

Grand Forks School	$ 124 40
Esquimalt Public School	206 20
Government Agent, New Westminster	71 00
Matsqui School	33 90
Port Hammond School	118 20
Murrayville School	56 85
Government Agent, Nelson	8 40
Mount Anarchist School, Bridesville	39 70
Peachland School	84 30
Government Agent, Kamloops	10 40
Ladner School	342 30
Maple Ridge School	233 80
Milner School	15 30
Langley Prairie School	64 50
Aldergrove School	79 55
Revelstoke School Board	151 75
Kelowna School Board	37 20
Mission Central School	126 25
Sardis School	161 50
Cloverdale School	27 30
Chilliwack School	47 45
Poplar Grove School, Penticton	61 50
Lord Lister School, New Westminster	134 30
Lord Kelvin School, New Westminster	57 00
McBride School, New Westminster	39 20
Connaught High School, New Westminster	273 70
Mission City School	12 10
Cowichan School Board, Bench School	235 60
West Langley School	30 00
Fort Langley School	174 20
Mental Hospital	30 00
Total value of nursery stock shipped	$3,087 85

NURSERY STATEMENT, 1917 (ESSONDALE).

Receipts.

Produce supplied Mental Hospital, Essondale, during the year 1917..	$ 8,028 89
Produce supplied Hospital for Insane, New Westminster, during 1917	498 60
Produce supplied Colony Farm, Essondale, during the year 1917	141 30
Nursery stock supplied to schools, etc., in the Province during 1917..	3,087 85
Inventory of produce and hay on hand, December 31st, 1917	5,155 88
Inventory of nursery stock on hand, December 31st, 1917	25,123 30
Total	$42,035 82

Disbursements.

Inventory of produce and hay on hand, January 1st, 1917	$ 3,212 28
Inventory of nursery stock on hand, January 1st, 1917	21,193 93
Feed for horses, etc., supplied by Colony Farm	4,929 56
Feed for horses, etc., supplied by Mental Hospital	495 75
Wages for 1917	4,260 00
Maintenance, including fertilizer	2,231 62
Balance (being profit)	5,712 68
Total	$42,035 82

1917.	Inventory of nursery stock	$25,123 30
1916.	Inventory of nursery stock	21,193 93
	Increase	$ 3,929 37

MEMORANDUM OF VEGETABLES AND FRUIT GROWN IN GARDEN AT FARM COTTAGE (HOSPITAL ANNEX), 1917.

Radishes	250	lb.
Lettuce	300	„
Spinach	200	„
Peas	1,070	„
„ (dried and shelled)	230	„
Potatoes	3,465	„
Strawberries	463	„
Onions (small)	370	„
„ (stored)	1,054	„
Tomatoes	1,200	„
Runner beans	440	„
Kidney beans	120	„
Cucumbers	180	only.
Squash	220	„
Pumpkins	86	„
Cabbage (green)	1,500	„
„ (red)	500	„
Cauliflower	500	„
Celery	650	hd.
Brussels sprouts	120	lb.
Kale	750	„
Rhubarb	200	„
Parsnips	350	„
Fruit, preserved	432	„
Sugar used for same	324	„
Pickled tomatoes, chow-chow	100	„
Pickled red cabbage	500	„

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1918.

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PROVINCE OF BRITISH COLUMBIA

TWELFTH ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE YEAR 1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour FRANK STILLMAN BARNARD,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

I have the honour to submit for your consideration herewith the Annual Report of the Department of Agriculture for the year 1917.

JOHN OLIVER,

Minister of Agriculture.

Department of Agriculture,

Victoria, B.C., February 7th, 1918.

Homestead in the Bulkley Valley.

"Madame Posch Pauline," No. 10291, owned by Colony Farm Essondale. Official record, 365 days: Milk, 27,597.4 lb.; butter-fat, 898.77 lb.; butter, 1,123.53 lb.

TABLE OF CONTENTS.

	Page.
Report of the Deputy Minister—Wm. E. Scott—	
Activities of Department	4
Act, Agricultural	10
Act, Brand	9
Act, Dairies Regulation	9
Act, Eggs Marks	10
Act, Sheep Protection	9
Agricultural Journal	11
Appreciation	13
Association, British Columbia Bee-keepers'	12
Association, British Columbia Dairymen's	11
Association, British Columbia Fruit-growers'	11
Association, British Columbia Goat-breeders'	12
Association, British Columbia Poultry	12
Association, British Columbia Stock-breeders'	11
Association, Vancouver Island Flockmasters'	12
Associations, Agricultural	11
Associations, Cow-testing	4
Associations, Provincial	11
Board of Horticulture	13
Clubs, Boys' and Girls'	4
Competitions, Crop	4
Competitions, Horticultural	7
Co-operative Variety Tests	5
Crop Conditions	1
Crops, Farm	1
Demonstration Orchards	6
Demonstration Plots	4
Demonstration Spraying	6
Demonstration Station, Pitt Meadows	5
Diseases, Control of	6
Entomological Work	8
Experimental Spraying	6
Experimental Stations, Dry-farming	5
Experimental Work, Drainage	5
Farmers' Institutes	10
Federal Grant	12
Field-work	7
Fire-blight	6
Food-conservation	3
Hog Production	3
Horticultural Branch	5
Insect Pests, Control of	6
Inspection of Imported Fruit and Vegetables	8
Labour	3
Legislation	9
Live Stock	2
Live Stock Branch	4
Markets Commissioner, Coast	7
Markets Commissioner, Prairie	7
Noxious Weeds	8
Packing-schools	6
Pathological Work	8

PAGE.

Report of the Deputy Minister—*Concluded.*
- Production 1
- Pruning-schools 6
- Settlement, Land 3
- Silo-construction 5
- Southern Okanagan Fruit and Vegetable Experimental Station 7
- Statistics Branch 9
- Tribute 13
- Variety Tests, Co-operative 5
- Veterinary Inspection 4
- Women's Institutes 10

Report of Provincial Horticulturist and Inspector of Fruit Pests (January to July)—R. M. Winslow—
- British Columbia Fruit-growers' Association 17
- Bud-mite, Black-currant 15
- Codling-moth 15
- Competitions, Horticultural Crop 16
- Crop Estimates 14
- Demonstration Orchards 15
- Demonstrations, Orchard 14
- Experimental Plots, Northern 16
- Experimental Station, Summerland 16
- Experiments, Spraying 16
- Experiments, Storage 16
- Fire-blight 15
- Inspection, Nursery 14
- Inspection of Potatoes for Export 14
- Inspection-work 14
- Institute Meetings 15
- Markets Commissioners 16
- Packing-schools 14
- Pest-control Work 14
- Pruning-schools 14
- Scope of Work 13
- Staff 13
- Thrips 15
- Visits, Orchard 14

Report of Provincial Horticulturist and Inspector of Fruit Pests—M. S. Middleton—
- Activities 17
- Anthracnose, Apple 20
- Black-currant Mite 19
- Codling-moth 19
- Competitions, Horticultural Crop 22
- Demonstration Field-work 18
- Demonstration Orchards 21
- Diseases, other 20
- Diseases, Potato 20
- Experimental Orchards 21
- Farm Survey and Statistics 18
- Fire-blight 20
- Grasshoppers 20
- Inspection of Empty Cars 19
- Inspection of Nurseries 19
- Inspection-work 18
- Institute-work 22
- Judging 22

PAGE.

Report of Provincial Horticulturist and Inspector of Fruit Pests—*Concluded.*
- Lecture-work 22
- Leaf-curl 20
- Markets Commissioner, Coast 23
- Markets Commissioner, Prairie 22
- Officials 18
- Packing-schools 18
- Peach-mildew 20
- Peach-twig Borer 20
- Pear-thrips 19
- Pest Situation and Control, Summary 21
- Pests, other 20
- Plots, Central British Columbia 21
- Pruning-schools 18
- Publications 22
- San Jose Scale 19
- Scab, Apple and Pear 20
- Southern Okanagan Vegetable and Fruit Station 21
- Strawberry-plot at Hatzic 21
- Strawberry-root Weevil 20
- Woolly Aphis 19

Report of Assistant Horticulturist and Inspector of Fruit Pests, Northern Okanagan, Shuswap Lake, Canadian Pacific Railway Main Line Section East of Lytton, and Upper Columbia Valley Districts—P. E. French—
- Aphides 27
- Apple-scab 26
- Codling-moth 28
- Competitions, Crop 24
- Crop Estimates 24
- Experiment, Locality 25
- Experimental Orchards 24
- Experimental Work 24
- Farmers' Institute Meetings 24
- Field-work 27
- Fire-blight 28
- Inspection of Empty Cars 27
- Inspection of Export Fruit and Vegetables 27
- Inspection of Nurseries 27
- Inspection, Pest 27
- Judging 24
- Oyster-shell Scale 28
- Packing-schools 23
- Pruning-schools 24
- San Jose Scale 28
- Survey-work 24

Report of Assistant Horticulturist and Inspector of Fruit Pests, South Okanagan and Similkameen Districts—B. Hoy—
- Codling-moth 30
- Competitions, Crop 30
- Experimental Work 29
- Fairs 29
- Inspection, Fire-blight 30
- Inspection of Fruit 30
- Inspection of Vegetables 30
- Meetings 29
- Pruning-schools 29

PAGE.

Report of Assistant Horticulturist and Inspector of Fruit Pests—*Concluded.*
- Short Course 29
- Survey, Orchard 30

Report of Assistant Horticulturist and Inspector of Fruit Fests, Vancouver Island and Lower Mainland Districts—E. W. White—
- Change of Position 31
- Competitions, Horticultural 33
- Crop Reports 35
- Demonstration-work 35
- Diseases 35
- Experimental Fall Spraying 34
- Experimental Strawberry-plot 33
- Fairs 34
- Insect Pests 35
- Inspection of Export Potatoes 32
- Inspection of Nurseries 34
- Pear-thrips Work, Saanich 31
- Production 35
- Pruning-schools 33

Report of Assistant Horticulturist, Kootenay and Boundary Districts—E. C. Hunt—
- Competitions, Horticultural 36
- Demonstration Orchards 37
- Experimental Orchards 37
- Experiments in Spraying 36
- Fairs 37
- Inspection-work 37
- Packing-schools 36
- Production 37
- Pruning-schools 36

Report of Assistant Horticulturist, Prince Rupert District—A. R. Neale—
- Institute Meetings 37
- Office-work 38
- Prospects 38
- Resignation 38

Report of Prairie Markets Commissioner—J. A. Grant—
- Activities 38
- Advertising 45
- British Columbia Markets, Expansion of 44
- Buying, f.o.b. 39
- Co-operative Marketing 45
- Fruit 40
- Impressions 39
- Packages 39
- Packing 39
- Products sold f.o.b., Refusal of 40
- Market wants, Growing for what 39
- Refrigerator-cars, New 40
- Supply, Increasing 39
- United Grain-growers want 400 Cars Apples 40
- Vegetables 43
- Weekly Reports 40

Report of Coast Markets Commissioner and Inspector in Charge of Exports—R. C. Abbott—
- Fruits 46
- Inspection of Eggs 46
- Inspection of Fruit 46
- Inspection of Potatoes 46

PAGE.
Report of Markets Commissioner and Inspector in Charge of Exports—*Concluded.*
Local Markets 46
Summary 48
Vegetables 47
Weekly Reports 46
Report of South Okanagan Fruit and Vegetable Experimental Station, Summerland—J. L. Hilborn—
Cantaloupes 50
Cucumbers 50
Egg-plant 50
Peppers 49
Tomatoes 49
Report of Plant Pathologist—J. W. Eastham—
Apple-scab 52
Anthracnose 51
Blight, Fire 53
Blight, Late 53
Codling-moth 54
Diseases, Potato 54
Diseases, New 51
Educational Work 56
Experiments, Field 51
Fusarium Rots 54
Peach-worm 53
Silver Scurf 54
Twig-borer 53
Vernon Office 55
Report of Inspector of Imported Fruit and Nursery Stock—W. H. Lyne—
Buildings, Fumigation 58
Diseases infecting Imported Nursery Stock 59
Fumigation, Experimental 58
Importation, Fruit 60
Importation, Potato 60
Imported Nursery Stock must come to Vancouver 59
Insects infecting Imported Nursery Stock 59
Insects infecting Rice, etc. 58
Mediterranean Fruit-fly 57
Nursery Stock condemned 59
Nursery Stock Imports 59
Protest, Rice-millers 58
Regulations, Dominion 60
Staff 56
Tuber-moth 57
Weevil 57
Report of Live Stock Commissioner—W. T. McDonald—
Brands 65
British Columbia Goat-breeders' Association 66
British Columbia Stock-breeders' Association 65
Clubs, Boys' and Girls' 65
Conditions 61
Dairy Division 63
District Agriculturists 64
Farmers' Institutes 66
Poultry Division 64
Silos 65
Soil and Crop Division 63
Veterinary Division 62

PAGE.

Report of Dairy Instructor and Inspector—T. A. F. Wiancko—
- British Columbia Dairymen's Association 70
- Canadian National Record of Performance 68
- Cheese-making 67
- Cow-testing Associations 68
- Creameries 67
- Dairies, City 67
- "Dairies Regulation Act" 68
- Dairy Industry 66
- Demonstrations, Dairy 70
- Fairs 70
- Lectures 70
- Office-work 70
- Prices of Dairy Products 66
- Testers, Official Milk 69
- Tests Official 68

Report of Poultry Instructor—J. R. Terry—
- Association, Provincial Poultry 72
- Breeding-stations 75
- Clubs 74
- Competitions, Boys' and Girls' 74
- Conditions 71
- Demonstrations 71
- Diseases 75
- Egg-laying Contest 73
- "Eggs Marks Act" 73
- Fairs 72
- Inspection 75
- Instruction 75
- Lectures 71
- Office-work 76
- Publications 75
- Rabbit-breeding 71
- Returned Wounded Soldiers, Instruction to 74
- Show Groups, British Columbia 73

Report of Soil and Crop Instructors—H. O. English and E. W. Hogan—
- Co-operative Variety Testing 82
- Correspondence 85
- Cost of Production Survey 84
- Demonstration Clover and Alfalfa Hulling 80
- Demonstration Seed-cleaning 81
- Demonstration Stations 76
- Demonstration Underdrainage 80
- Field-crop competitions 81
- Inspection, Farm and Crop 85
- Meetings 85
- Seed Fairs 82
- Short Courses 85

Report of Chief Veterinary Inspector—A. Knight—
- Abortion, Contagious 86
- Dairies and Stables, Sanitary Condition of 86
- Influenza 86
- Tuberculosis 86
- Verminous Bronchitis 86

Report of District Agriculturist, Kamloops District—G. C. Hay—
- Activities 87

PAGE.
Report of District Agriculturist, Kamloops District—*Concluded.*
Competitions, Field 88
Crops 87
Fairs 88
Live Stock 87
Report of Silo Demonstrator—R. J. Ferris 88
Report of Agriculturist and Acting-Editor—M. A. Stuart 89
Report of Secretary—W. J. Bonavia—
Associations, Agricultural Fairs 92
Bee Inspection 92
British Columbia Students 91
Correspondence 90
Farmers' Institutes 93
Financial 90
Horticultural Licences 92
Noxious Weeds 95
Seed-grain Distribution 91
Staff 89
Women's Institutes 94
Report of Statistics Branch—A. B. Tweddle—
Consumption *per Capita* 97
Correspondents, Crop 97
Cost of Production 97
Exports—Collection of Data 97
Imports—Collection of Data 97
Production, Statistics relating to 98
Publications 97
Results, Comparative 97
Results of 1917 Methods 96
Scope 96
Report of Foul-brood Inspector, Lower Mainland and Vancouver Island Districts—F. D. Todd—
Activities 99
Crop, Honey 100
Disease 99
Foul-brood 99
Season 99
Report of Foul-brood Inspector, Okanagan and Thompson River Districts—L. Harris—
Exhibits 100
Foul-brood 100
Organization 100
Season 100
Report of Foul-brood Inspector, Kootenay and Boundary Districts—W. J. Shephard—
Bees in Orchards 101
Crop, Honey 101
Demonstrations 101
Experiments 101
Foul-brood 102
Honey Sources 101
Loss, Winter 101
Report of Secretary, Advisory Board, Women's Institutes—Mrs. M. S. Davies—
Advisory Board 102
Clubs, Boys' and Girls' 102
Conferences 102
Flower-shows 102
Lectures 102
Patriotic Work 102

PAGE.

Report of Secretary, Advisory Board, Women's Institutes—*Concluded.*
Programmes 102
Publications 102
School-work 102

APPENDICES.

Appendix No.—
1. Pruning-schools 104
2. Packing-schools 105
3. Fruit and Vegetables received at Vancouver, 1917 107
4. Stocks of Fruit and Vegetables on hand, Vancouver 107
5. Receipts and Expenditures, Southern Okanagan Fruit and Vegetable Experimental Station 108
6. Chilliwack Cow-testing Association 109
7. Records of Individual Cows, British Columbia 110
8. Creameries in British Columbia 111
9. Summary of Creamery Report 111
10. Examination for Tester's Licence, "Dairies Regulation Act" 112
11. Egg-laying Contest 113
11A. Summary of Egg-laying Contest 114
12. Poultry Associations 115
13. Fertilizer Tests with Potatoes 116
14. Crop Competitions—Yields, Costs, etc. 116
15. Tuberculin Tests 117
16. Silos built 118
17. Silos filled 118
18. Temporary Staff appointed 119
19. Correspondence received and dispatched 120
20. Publications issued by Department 121
21. Publications sent out 122
22. Summary of Appropriations 124
23. "Agricultural Instruction Act" 125
24. Provincial Votes 126
25. Fairs arranged 126
26. Grants to Agricultural Associations 128
27. Expenditure in Aid of Farmers' Institutes 129
28. Farmers' Institute Meetings 129
29. Expenditures in Aid of Women's Institutes 131
30. Women's Institute Flower-shows 132

BRITISH COLUMBIA DEPARTMENT OF AGRICULTURE.

BRANCHES AND CHIEF STAFF MEMBERS, YEAR 1917.

Minister of Agriculture:

Hon. JOHN OLIVER.

Deputy Minister:

WM. E. SCOTT.

Secretary:

WM. J. BONAVIA.

Statistician:

A. B. TWEDDLE.

Secretary to Minister:

E. J. ROSSITER.

Horticultural Branch:

R. M. WINSLOW, B.S.A., Provincial Horticulturist and Inspector of Fruit Pests.
M. S. MIDDLETON, B.S.A., Assistant Horticulturist and Inspector of Fruit Pests to July 7th, and Provincial Horticulturist and Inspector of Fruit Pests from July 7th to December 31st.
B. HOY, B.S.A., Assistant Horticulturist and Inspector of Fruit Pests.
H. THORNBER, B.S., Assistant Horticulturist and Inspector of Fruit Pests.
E. W. WHITE, B.S.A., Assistant Horticulturist and Inspector of Fruit Pests.
P. E. FRENCH, B.S.A., Assistant Horticulturist and Inspector of Fruit Pests.
E. C. HUNT, B.S., Acting Assistant Horticulturist and Inspector of Fruit Pests.
W. H. ROBERTSON, B.S.A., Assistant Horticulturist and Inspector of Fruit Pests (on active service).
M. H. CHESBRO, B.S., Assistant District Fruit Pest Inspector.
W. T. HUNTER, B.S.A., Assistant District Fruit Pest Inspector.
J. TAIT, Assistant District Fruit Pest Inspector.
H. H. EVANS, Assistant District Fruit Pest Inspector.
C. R. BARLOW, District Fruit Inspector.
H. GUTTERIDGE, Assistant Potato Inspector and Investigator of Potato-diseases.
R. C. ABBOTT, Coast Markets Commissioner and Inspector in Charge of Exports.
W. E. MCTAGGART, Prairie Markets Commissioner.
J. A. GRANT, Prairie Fruit Markets Commissioner, succeeding W. E. McTaggart.
J. L. HILBORN, in charge, Fruit and Vegetable Experimental Station, Summerland.
S. LEC. GRANT, Caretaker, Demonstration Plot, Bella Coola.
H. T. THOMPSON, District Fruit Pest Inspector.
E. W. BUCKELL, Inspector on Codling-moth.
J. R. CHEESMAN, Inspector on Codling-moth.

Imported Fruit Inspection Branch:

W. H. LYNE, Inspector of Imported Fruit and Nursery Stock, Rice, etc.
D. GAVET, Assistant Inspector of Imported Fruit and Nursery Stock, Rice, etc.
W. J. GRAHAM, Assistant Inspector of Imported Fruit and Nursery Stock, Rice, etc.
H. F. OLDS, Assistant Inspector of Imported Fruit, Vegetables, Rice, etc.

Plant Pathology and Entomology Branch:

J. W. EASTHAM, B.Sc., Plant Pathologist.
M. H. RUHMANN, Assistant Plant Pathologist.

Live Stock Branch:

W. T. MCDONALD, M.S.A., Live Stock Commissioner.
S. H. HOPKINS, B.S.A., Assistant Live Stock Commissioner.
H. RIVE, B.S.A., Dairy Instructor and Inspector (on active service).
T. A. F. WIANCKO, Dairy Instructor and Inspector.
J. R. TERRY, Instructor in Poultry-raising.
H. E. UPTON, Assistant Instructor in Poultry-raising.
H. O. ENGLISH, B.A., B.S.A., Soil and Crop Instructor.
E. W. HOGAN, B.S.A., Soil and Crop Instructor.
W. NEWTON, Soil and Crop Instructor (on active service).
H. E. WALKER, B.S.A., Agriculturist.
G. C. HAY, B.S.A., Agriculturist.
J. H. MCCULLOCH, B.S.A., Agriculturist.
S. F. DUNLOP, B.S.A., Agriculturist (on active service).
Dr. A. KNIGHT, V.S., Veterinary Inspector.
Dr. S. A. K. WHITE, V.S., Assistant Veterinary Inspector.
Dr. W. W. ALTON, V.S., Assistant Veterinary Inspector.
Dr. B. R. ILSLEY, V.S., Assistant Veterinary Inspector.
E. RIVE, Official Milk-tester.
G. H. THORNBERY, Cow-tester.
J. B. WATSON, Official Milk-tester.
R. J. FERRIS, Silo Demonstrator.
W. H. STROYAN, Poultry Caretaker.

Foul-brood Inspectors:

F. D. TODD, Victoria.
W. J. SHEPHARD, Nelson.
L. HARRIS, Vernon.

Women's Institutes:

Mrs. M. S. DAVIES, Secretary, Advisory Board.
Mrs. J. S. CHALMERS, Lecturer.

Clerical:

G. B. MARTIN.
G. L. FOULKES (on active service).
C. P. L. PEARSON.
GEO. PILMER.
R. E. MITCHELL.
G. S. ROTHWELL.
J. H. BUCKETT.
G. H. STEWART (on active service).
M. BROOKING.
E. L. FLETT.
E. T. WILLIAMS.
V. F. BABINGTON.
M. M. PATCHETT.
P. WARREN.
A. E. HILL.

General:

A. H. SHOTBOLT, General Assistant.
D. E. MACKERETH, Carpenter.

Publications Branch:

J. R. MCLENNAN, Editor.
M. A. STUART, Agriculturist and Acting-Editor.

REPORT OF THE DEPARTMENT OF AGRICULTURE.

REPORT OF THE DEPUTY MINISTER OF AGRICULTURE.

WM. E. SCOTT.

Hon. John Oliver,
Minister of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my report on agricultural conditions and the work of the Department of Agriculture for the year 1917.

PRODUCTION.

The total value of agricultural production for the past year shows an increase in value in excess of $3,000,000 over 1916. This is due to the high prices which have prevailed for practically all lines of farm produce. Actual production, however, shows a slight decrease, due to the acute labour shortage which exists and to the unfavourable climatic conditions which prevailed in many of the farming sections of the Province, and which materially curtailed production.

CROP CONDITIONS.

The year 1917 was an unfavourable one for our agriculturists in most parts of the Province. On Vancouver Island and the Lower Mainland the spring was cold and backward, with persistent wet weather at seeding-time, which delayed unduly the seeding of low-lying lands. The summer months were exceptionally dry and crops on light soils consequently suffered. In the Southern Interior districts an exceptionally hot, dry summer seriously affected crops, especially in those parts in which irrigation is not practised. In the dry-farming areas especially, crops were very light and in some cases a total failure. In the cattle-raising districts of the Thompson and Nicola Valleys, Cariboo, Lillooet, and Chilcotin, whilst field crops were below normal, range lands were in good condition and cattle and sheep did well. In the farming districts between Prince Rupert and Tete Jaune Cache, adjacent to the line of the Grand Trunk Pacific Railway, the season was on the whole a favourable one. Hay and grain crops yielded well and were of excellent quality. Summer frosts occurred in places and did some damage to crops, more especially root-crops. In the Pouce Coupe and Fort St. John districts of the Peace River country good crops were secured. A considerable settlement of these districts has taken place during the past few years and crop production has consequently been largely increased. A very considerable amount of grain is now grown.

FARM CROPS.

Wheat.—The wheat-crop of the Province shows a lighter yield per acre, due to an unfavourable season in many districts, but there was a considerable increase in the acreage sown to this crop. This increase is particularly noticeable in the Peace River District, in dry-farming areas, Cariboo, Lillooet, Thompson, Nicola, and Okanagan. The crop was of good quality and on the whole harvested in excellent condition. The growing of winter wheat should be practised more extensively by farmers in many of our districts, especially on Vancouver Island and the Lower Mainland, on high-lying lands. It has been clearly demonstrated that winter wheat will give better yields than spring wheat on lands of this description.

Oats.—This is our principal grain-crop. The yield was below the average. Late crops on Vancouver Island and the Lower Mainland suffered from wet weather in the month of September. Excellent crops were grown in Central British Columbia and the Peace River country. Production shows a slight decrease as compared with the previous year.

Barley.—This crop is not grown to the extent it should be. Good crops are secured in practically all parts of the Province, and, considering its value as a stock-food, it should be grown more extensively by farmers who keep stock, especially hogs.

Peas.—The extremely high price of seed-peas has prevented any extensive seeding of this crop by farmers. Peas and oats are generally grown, cut green, and used either as a roughage or for ensilage purposes. It is a favourite crop with dairymen, who find it very suitable for milk production.

Hay.—The hay-crop was a fair one and generally harvested in good condition. There is a decrease in the quantity of natural meadow and clover and timothy hay grown in the Province, due principally to the fact that the high cost of grain has resulted in farmers ploughing up some of their hay lands and seeding to grain.

Alfalfa.—The acreage devoted to growing this valuable fodder-crop is rapidly increasing, especially in the irrigated districts of Southern British Columbia, where three cuttings of this nutritious grass are generally made, with a yield in many cases ranging from 5 to 8 tons per acre. Good results are being obtained by many of our farmers in pasturing hogs on alfalfa, and it is also, of course, of great value for ensilage purposes.

Corn.—The year was an unfavourable one for corn, the yield being generally light. The acreage devoted to the growing of fodder corn is increasing very rapidly, principally owing to the extensive use of silos, which are now being built over practically all our farming districts.

Potatoes.—There was a considerable increase in the acreage planted to this crop, but the yield was lighter, being approximately 95 per cent. of a normal crop. Tubers were small, and consequently the amount available for commercial use was materially reduced. There was also a considerable amount of disease in the potato-crop. Farmers should be more careful in the selection of seed, and in all instances should treat their seed before planting it.

Roots.—The acreage devoted to roots showed a material decrease, due principally to the acute farm-labour shortage. The crop was considerably below normal.

Other Vegetables.—These were generally a fair crop, but light in some districts owing to unfavourable weather conditions.

Tree-fruits. The crop of tree-fruits was light but of good quality in the Coast districts. In the important fruit-growing centres of the Interior the crop was on the whole a good one. The fruit was of excellent quality and very free from disease. There was an increase of approximately 15 per cent. over 1916 in the Okanagan Valley. In the Boundary, Kettle Valley, and Kootenay Districts the crop was a light one, the fruit being clean, but small in size.

Small Fruits.—The strawberry-crop on Vancouver Island was a light one, but the berries were of excellent quality and the crop was successfully harvested and marketed. The picking season, owing to the hot, dry weather which prevailed at picking-time, was of exceptionally short duration, with a resultant curtailment of the crop. Raspberries also were a light crop, but on the whole gave satisfactory returns to the growers. Some damage was done by wet weather at the picking season.

LIVE STOCK.

Dairying.—The dairying industry has suffered owing to the labour shortage, which has caused many dairymen with limited means to sell off or curtail their herds.

Beef Cattle.—The year was a successful one for beef cattle, the ranges of the Interior affording good pasturage.

Hogs.—The high prices prevailing as a result of the world shortage of hogs have encouraged farmers to keep more of this stock, and the patriotic appeal to farmers for increased hog production has met with a ready response from them, and we may anticipate a large increase in hog production during the present year.

Sheep.—The high prices of mutton and wool have given a decided stimulus to the sheep industry. In many of the Interior districts of Southern British Columbia there are considerable flocks of sheep which are proving very remunerative to their fortunate owners. The "Sheep Protection Act," passed at the last session of the Provincial Legislature, provides means whereby owners of sheep are protected from the ravages of dogs. The south-eastern part of Vancouver Island, with the adjacent Gulf Islands, has been proclaimed a sheep district under the Act, and beneficial results are apparent. There is a great scarcity of breeding ewes, and this, added to the very high price, makes it difficult for those who wish to start in the sheep-raising industry to make a beginning. There are many suitable areas for sheep-raising in the Province, and we may look forward to a rapid development in the near future of this phase of the live-stock industry.

Poultry.—The excessive cost of poultry-feeds has militated against the development of the poultry industry. Farmers who are in a position to raise on their farms the necessary poultry-feeds are making good profits with the high prices that have prevailed for poultry products, but the poultryman on the small holding who has to purchase all his poultry-feed finds it difficult to make a satisfactory profit, and many of these poultrymen have consequently gone out of the business.

Goats.—Many people in the Province are giving attention to the keeping of goats, which are of great service to small land-owners who are unable to keep a cow. Goats are also very useful for land-clearing purposes, and there are many parts of our Province where these could be ranged in large numbers; and with the very high prices prevailing for mohair, there should be good returns to be made out of goat-raising in suitable localities. A Goat-breeders' Association has been formed and has now a considerable membership. Importations of pure-bred goats have been made into the Province, and it is likely that in the near future this industry will become firmly established in certain parts of the Province.

LAND-SETTLEMENT.

As a result of the great world war, immigration to our Province has materially declined. A considerable settlement has, however, taken place recently in the Dominion Peace River Block, more particularly in the Pouce Coupe and Fort St. John Districts; the completion of the Dunvegan-British Columbia Railway to Spirit River, which is distant about seventy miles from Pouce Coupe, has facilitated ingress to this fine agricultural district. At the present time all business from the Peace River country goes to the Province of Alberta, and will, of course, remain so until an outlet has been afforded to our Coast cities by the completion of railway transportation. What settlement is taking place is practically all from the United States and the neighbouring Provinces of Alberta, Saskatchewan, and Manitoba. The scarcity of labour and the high cost of stumping-powder have also proved detrimental factors to the settlement of our vacant lands.

LABOUR.

British Columbia, in common with all other countries, is suffering from an acute labour shortage, and this especially applies to farm labour. When we consider that not less than 40,000,000 producers from the soil are either fighting or engaged in other lines of war-work, it is not to be wondered at that labour should be scarce. Whilst our farmers by dint of hard work and strenuous effort have kept production nearly up to the level of the previous year, unless some solution to the labour problem can be found immediately our production must show a further falling-off in 1918. Efforts have been made towards the mobilization of our home supply of labour, and by a proper and effective organization of our women and boys from public and high schools the situation can no doubt be materially improved and alleviated. We see what the women of Great Britain and France are doing on the farms, and the time has come when women of Canada must also come to the rescue and help in our fields and orchards, so that we may not only maintain our production, but increase it. Food is now the vital factor in the war, and America and Canada are being called upon to supply large quantities, so that our fighting forces and those of our Allies and the civilian population may be sufficiently fed. Throughout the Dominion strenuous efforts are being made to solve the labour problem and to produce the foodstuffs so vitally needed.

INCREASED HOG PRODUCTION.

Bacon is the fighting food and must be supplied to the fighting forces in sufficient quantities. A campaign for increased hog production is being vigorously prosecuted throughout the Dominion and good results are expected. An energetic publicity campaign is being carried out by our Department, and we have thoroughly competent men in the field who are holding publicity meetings for farmers, visiting them on their farms, in order to discuss ways and means, and generally to advise how they may keep more hogs and raise them economically and profitably.

FOOD-CONSERVATION.

A Dominion-wide appeal has been made directed towards the conservation of beef, bacon, and wheat-flour, the exportable products needed by the Entente nations. The public of Canada are being asked to conserve these foods by voluntary saving, by using perishable products in

their place, and by eliminating all waste. Already a good response has been made by the people of British Columbia. "Increased production, conservation of exportable products, and the elimination of waste" is the slogan for 1918, and all departmental officials are featuring this in their work amongst farmers.

ACTIVITIES OF DEPARTMENT OF AGRICULTURE.

Owing to the depletion of the staff of agricultural experts and the curtailment of Provincial appropriations, the educational activities of the Department have of necessity been somewhat reduced, but every effort has been made to maintain our chief lines of work in a state of efficiency.

LIVE STOCK BRANCH.

The work of the Live Stock Branch has been actively maintained under the direction of Live Stock Commissioner W. T. McDonald.

Veterinary Inspection.—An active campaign was undertaken by the Veterinary Inspection Division towards the control and eradication of bovine tuberculosis amongst our dairy herds, and with very satisfactory results. There were 15,398 dairy cows tested during the year. Out of this number there were 579 reactors, or a percentage of 3.8. The result of the aggressive work of previous years directed towards the control of this insidious disease—which is not only a serious menace to the public health, but is also a cause of great economic loss to dairymen—is plainly evidenced by the substantial decrease in the percentage of reactors to the test, and is also shown by the lessened degree of infection. A vigorous continuation of the work will undoubtedly result in the practical elimination of this disease from our dairy herds.

Demonstration Plots.—Work on the various demonstration plots which has been carried on for the last few years was discontinued at the end of the year, as it was considered that the object for which these plots were originally established had been practically accomplished. It was also thought that the money used on this work might now be more profitably employed in other lines of work. Valuable data and information have been secured by the Department, which will later be published in bulletin form for the information and guidance of farmers. There were eight of these demonstration stations operated under the supervision of the Soils and Crop Division during 1917, being located at Armstrong, Chilliwack, Edgewood, Errington, Pitt Meadows, Grand Forks, Rock Creek, and Rose Hill. Work on the demonstration plot at Pitt Meadows will be continued during the present year.

Cow-testing Associations.—The work of the Cow-testing Associations at Chilliwack, Langley, Surrey, Delta, and Comox continues to hold the interest of farmers in this important phase of their dairy operations. Results obtained by keeping careful records of weights and tests of each cow's milk, together with the approximate cost of her feed, have been most useful, in that the farmer has been able to intelligently weed out his poor cows and save for breeding purposes the progeny of his profitable cows. There is no doubt that these associations have been the means of starting some of our progressive owners of high-producing dairy cows on the way to permanent success, and have by example assisted to a great extent many other dairymen. This work could be largely increased and extended if suitably trained men were available as Supervisors. Great difficulty has been experienced in securing efficient testers, owing to enlistments and the general scarcity of help and the high prices being paid for ordinary labour.

Crop Competitions.—Many competitions in the growing of various field crops were carried out during the year under the auspices of Farmers' Institutes, and on the whole they were very successful, and keen rivalry was shown by competitors in their work. By encouraging a spirit of friendly rivalry between farmers in this manner, undoubtedly better farming methods are engendered. The value of the work is plainly evidenced by the better farming methods which are now practised in the districts in which these competitions have been held for a number of years, and in the heavier crops which are now produced. Eighty competitions were carried out, with a total entry-list of 718 plots. The crops grown in these competitions were potatoes, oats, grain-hay, wheat, mangels, carrots, corn, clover, alfalfa, turnips, and kale. It is anticipated that there will be a large increase in this important educative work during 1918, and plans are now being made to carry out the work to the best advantage.

Boys' and Girls' Clubs.—Boys' and Girls' Clubs have proven a very important line of agricultural extension work, and the results have been very gratifying. During the year 1917

there were thirty clubs and forty competitions held. Plans are being made to emphasize the pig-raising competitions during the year 1918. It is hoped that a closer supervision of the work of the boys and girls may be feasible in future.

Co-operative Variety Testing.—Good educative work has been carried out among our farmers by means of supplying selected seed of various kinds to farmers in different districts in order to try out their merits. The scarcity of reliable information as to varieties of mixed-farming crops suited to soil and climatic conditions in different districts has resulted in each farmer growing those varieties which he considered best. By the distributon of samples of first-class seeds of the more important field crops to farmers more uniformity in crop production has been ensured, and this very important work will be further extended during the present year.

Drainage Experimental Work.—The need for underdrainage in certain parts of our unirrigated districts has become more evident each year. In order to find out how this matter may best be handled, the Department secured a Cyclone ditcher and offered to loan this machine, together with the services of a drainage expert, to the farmers free of charge. Unfortunately, through some delay, the machine was late in being delivered, and we were therefore not able to carry out as much experimental work as we had intended. Seven farmers, however, availed themselves of this offer during 1917. The official in charge of this work visited various farms wherever fields needed drainage and advised the various owners as to how they might best handle the situation. It is anticipated that this experimental work will result in showing farmers how they can reduce the labour incidental to work of this nature.

Pitt Meadows Demonstration Station.—The site for this station was chosen in 1916, being located on the farm of F. V. Harris. Work was commenced in the autumn of 1916, when the land was ploughed deeply and a system of tile draining installed. The demonstration-work was commenced in 1917. Valuable data have been secured as a consequence of the operations on this plot as to the best methods of soil-treatment on peat lands. Whilst some very striking results were obtained, it will be necessary to continue the work for several years before the Department will be in a position to make any definite recommendations as to how the soils of the Pitt Meadows may best be handled and the highest crop production secured. The investigational and experimental work being carried out on this plot should prove of inestimable value to farmers in the Pitt Meadows District and other places where they have similar soil conditions.

Dry-farming Experimental Stations.—The Department of Agriculture took over the management of the dry-farming stations at Quilchena and 105-Mile House at the beginning of April, 1917. A larger number of live stock is being maintained on these farms than formerly, and they are being placed on a self-supporting basis by reducing the extent of experimental work with grains. More or less extensive work will be carried on with grasses and other forage-crops.

Silo-construction.—The Department of Agriculture commenced their campaign for the increase of silos in 1914. In that year three silo-filling demonstrations were given in Chilliwack. At that time there were about forty silos in the Province; to-day there are approximately 525. Of this number there have been erected by the Department's representatives fifty-three, or 10 per cent. of the actual number. More than 50 per cent. of the silos in the Province are of the type which have been advocated by the Department from the commencement of the campaign. I consider this work one of the most valuable lines which has been undertaken by the Department. The silo-construction work was carried out hand in hand with a corn-growing campaign. Silos are being rapidly constructed in all parts of the Province, especially in those districts where corn can be successfully grown. Dairymen who have silos universally state that they are getting infinitely better returns than they did before they had them. By means of the silo the farmer is able to cut down very largely on the expensive grain ration and feed his dairy and other stock far more economically and profitably. Oats and peas give ensilage of a quality equal to that of corn and are being grown by many of our farmers. British Columbia will shortly become the silo Province of the Dominion, and there is nothing that will do more to further the dairy industry and to increase milk production than the use of silos by our farmers.

Horticultural Branch.

The work of this Branch is ably directed by M. S. Middleton, Provincial Horticulturist and Inspector of Fruit Pests, who was promoted to the position rendered vacant by the retirement earlier in the year of R. M. Winslow, who for so many years energetically and faithfully administered the work of this Branch.

Demonstration Orchards.—The work on demonstration and experimental orchards has been discontinued, the orchards which were started some years ago having run the time agreed upon between the Department and the owners. Much valuable data have been secured by their operations as to the varieties best adapted to the respective districts, right methods of orchard practice, control of insect pests, diseases, etc., which have proved of great value to our fruit-growers.

Control of Insect Pests and Diseases.—Efficient work has been carried out by officials of this Branch towards demonstrating to fruit and vegetable growers the most effective and economical methods of controlling and eradicating insect pests and diseases affecting fruits and vegetables. Special efforts have been directed towards the control and, if possible, eradication of the codling-moth, which has obtained a foothold in some sections of the Province. Very satisfactory results have been obtained in our strenuous fight against this serious pest which has caused such a great economic loss in other countries in which it is prevalent. R. C. Treherne, representative in this Province of Dr. Gordon Hewitt, Dominion Entomologist, has carried out valuable investigation and research work in the life-history of the codling-moth, which has proved of material assistance to the officials of this Department and to our growers in combating the pest. This co-operation on the part of the Federal Government in this important work is highly appreciated.

Fire-blight.—It is satisfactory to report that fire-blight is now well under control. It is necessary, however, that our fruit-growers be vigilant and keep a close watch on their orchards for any reappearance of this serious bacterial pest, which has caused the loss of thousands of fruit-trees in the Okanagan Valley and other fruit districts in the Interior. Demonstration-work directed towards showing the most effective method of control of the apple and pear blight has been strikingly successful, and fruit-growers have had it clearly demonstrated to them that this disease, which annually causes a great loss, can be kept almost completely under control by spraying with correct mixtures at the right time. Thanks to the capable and energetic work carried out by R. C. Treherne and Dr. Cameron, Assistant Entomologist to Dr. Gordon Hewitt, Dominion Entomologist, in co-operation with officials of the Horticultural Branch, the pear-thrip, which was commencing to work such havoc in orchards on Vancouver Island, more particularly those adjacent to the City of Victoria, has been effectively handled. The work carried out by these officials has clearly shown fruit-growers how the damage caused by these pests may by the adoption of right methods be reduced to a minimum. The thanks of this Department and all fruit-growers must be accorded to the Dominion Entomologist and his competent assistants for the valuable services they have rendered.

Fruit-packing Schools.—The policy of the Department of holding fruit-packing schools in different fruit districts in order to teach correct methods of grading and packing fruit, and thereby providing a corps of expert packers amongst our young men and women who are available when their services are required for putting up ready for market our various fruits, was further extended in 1917, and in conjunction with the Education Department, who arranged classes to be held for high-school boys and girls, no less than sixty-one schools were successfully held. The total number of pupils at these classes was 1,037. With very few exceptions there was a full attendance, and great interest and application was shown by those taking the classes. In the case of adults the classes were of five and three days' duration, with six hours' tuition a day. In the case of schools for boys and girls from our high and public schools the classes were of ten days' duration, with three hours' tuition a day. Competent instructors were furnished by the Department. An entrance fee of $1 was charged; all other expenses were paid conjointly by the Agriculture and Education Departments. The value of this work, which is now in its fifth year, is plainly apparent in the steady improvement of the quality of the pack of fruit put up in our fruit districts, which bears favourable comparison with that of our United States competitors.

Pruning-schools.—A number of pruning-schools were held by our officials in the different fruit districts. This work is very necessary. Many thousands of boxes of fruit have been lost in past years by injudicious and incorrect pruning, and it is with the object of avoiding future loss from this cause that these pruning-schools are held. Much interest is shown in them by fruit-growers and they are well attended.

Experimental and Demonstration Spraying.—The officials of the Horticultural Branch, in co-operation with the Provincial Plant Pathologist, have been conducting plots at different points

in the Province, viz.: Salmon Arm, Vernon, Kelowna, Needles, Nelson, and Creston, for the control of apple-scab; at Keating for the control of apple anthracnose; and at Royal Oak, in co-operation with the Dominion Entomological officials, for the control of pear-thrips. All these demonstrations have proven very successful and instructive to growers in the different districts. They have proven conclusively in each case that these pests can by proper application of the right materials at the correct time be successfully controlled from a commercial standpoint. They have in all cases verified the information given out by the Department in the most impressive manner.

Horticultural Competitions.—During 1917, twenty-seven different horticultural competitions were held in various parts of the Province, with very excellent results. Twelve farm garden, eight city garden, three strawberry, two bearing orchard, one raspberry, and one onion competition were conducted. The interest created by these competitions wherever they were held has greatly encouraged the growing of better crops and increased production generally. The farm- and city-garden competitions have encouraged the growing of fresh vegetables, etc., to supply the home needs throughout the season, with very gratifying results.

Southern Okanagan Vegetable and Fruit Station, Summerland.—The principal aim at this station was to demonstrate that by practising proper methods tender-vegetable crops can be profitably and successfully grown in this section of the Province. The yields and returns which Mr. Hilborn, who is in charge, has obtained at the station this year fully justified the undertaking, and will lead to the encouragement of other growers taking up this profitable line of crops. The demand for these vegetable-crops—such as tomatoes, egg-plant, cucumbers, and cantaloupes—is growing very rapidly; in fact, much faster than the production can take care of it, and the accurate data as to yields, costs, and returns furnished by Mr. Hilborn are of the greatest value as information to this Department.

Coast Markets Commissioner and Inspector of Exports.—R. C. Abbott is our Markets Commissioner and is stationed in the City of Vancouver. Very valuable work has been done by this official in the way of helping farmers and fruit-growers to find the best markets for their produce. By means of a weekly market report Mr. Abbott keeps farmers in close touch with market conditions, crises, etc., and this information has undoubtedly resulted in saving farmers many thousands of dollars. Mr. Abbott as an Inspector under the "Eggs Marks Act" has done good work in the City of Vancouver in seeing that the provisions of the Act are being observed. Several prosecutions for violations of the Act have been instituted and offenders fined, and in consequence the Act is now being well observed by dealers in Vancouver. A very important work carried out by Mr. Abbott is that of the inspection of potatoes for export. All potatoes shipped to markets outside the Province are inspected by our men, and if found free from disease a certificate is granted; if not, they are not allowed to be shipped out and may be sold to evaporators or in our local markets. As a result of this work the standard of our potatoes has been well maintained in foreign markets and a good export business has been built up.

Prairie Markets Commissioner.—J. A. Grant was appointed, on the retirement of Mr. McTaggart, to fill the position of Prairie Markets Commissioner. Valuable services have been rendered to our farmers marketing their fruits and vegetables in the Provinces of the Middle West by our Commissioner. A weekly markets report was issued throughout the season from the Calgary office by Mr. Grant, and both fruit-growers and shipping organizations were kept well posted on prices, condition of shipments on arrival, best markets, etc. Valuable publicity work was also carried out and every effort made to encourage the policy of Canadian fruit for Canadian people. As a result of the vigorous campaign directed towards popularizing British Columbia fruits and vegetables in the markets of the North-west, dealers, other things being equal, will always now give the preference to the British Columbia products. The grade and pack of our fruits bears favourable comparison with the best shipped from the United States. Fruit-growers, however, must not rest content on their laurels, but continue to improve each year, for it will only be by their putting up an honest and attractive pack that they will be able successfully to hold their own against the keen competition that they will inevitably have to face from their United States neighbours.

General Field-work

Probably the most valuable results obtained by District Agriculturists and assistants, Horticulturists and assistants of the Dairy, Poultry, Live Stock, and Soils and Crops Branches

are by means of personal visits made to farmers and fruit-growers. It is by visiting the farmer on his place, discussing with him his problems and difficulties, and endeavouring to help him to find a satisfactory solution to them that the most useful and valuable work can be done, and farmers encouraged and educated along lines of better farming, which naturally leads to better crops, better stock, and more production. The greater part of the time of our officials is employed in this manner. It has been the experience of other countries that the best results can be obtained and farmers assisted to the best advantage by means of the appointment of men of the right type as District Representatives in the various districts. By their means the Department and farmers are drawn into a closer and more sympathetic touch, which ensures results in better and more effective work.

Noxious Weeds.

It is regrettable to have to report the continued spread of noxious weeds in the Province. Farmers do not sufficiently realize their responsibility in the matter. The "Noxious Weeds Act" is a stringent one. To see that it is enforced in their district is the duty of farmers. All Provincial constables are Inspectors under the Act, and in the event of neglect to observe the provisions of the Act Provincial constables should be informed. It would then be their duty to take the necessary action to compel delinquents to effectively destroy noxious weeds on their lands, so that they may not prove a menace to their more progressive neighbours who are endeavouring to keep their lands clean. Whilst it would be manifestly impossible to undertake the destruction of noxious weeds on all wild lands in uncultivated areas, every effort should be made to deal with weeds in settled agricultural communities, and the destruction of weeds on public roads passing through such areas should be taken in hand by the Public Works Department. It is the duty of all municipalities to take care of the noxious-weeds question within the confines of their municipality, and a rigid enforcement of the Act by municipalities will materially help to combat this evil. Weeds can be effectively handled and are not feared by the up-to-date farmer who follows a proper crop-rotation method, and it is only by these means that weeds can be effectively kept under control on the farm.

Pathological and Entomological Work.

This work is under the direction of J. W. Eastham, Plant Pathologist. We have two laboratories in which investigational and research work is carried out—at the Court-house, Vernon, and at the Court-house, Vancouver. Mr. Ruhmann, Assistant Entomologist, is in charge of the laboratory at Vernon and carries on all entomological work. A very satisfactory arrangement, through the courtesy of Dr. Gordon Hewitt, has been made between this Department and that of the Dominion Entomologist, whereby all entomological work in the Province will in future be carried out under the direction of R. C. Treherne, assistant to Dr. Gordon Hewitt, and his representative in our Province. This co-operation of the Federal Government so kindly given by Dr. Hewitt is much appreciated, and will tend to better and more effective entomological work being carried on. Mr. Eastham will concentrate his energies on the study of plant-diseases and in general pathological investigation and research work, so that our farmers and fruit-growers may be put in possession of the best information with regard to methods of control of plant-diseases and thereby safeguard themselves from economic loss. Full sets of the different plant-diseases and their different steps of development have been prepared by Mr. Eastham and are put up in Riker mounts. Similar work is being carried out in the laboratory at Vernon by Mr. Ruhmann with regard to insect pests. During the year field-work is carried out by these officials, and advice and assistance given to fruit-growers on their places with reference to correct methods of treatment and control.

Inspection of Imported Fruit and Nursery Stock.

This work is carried out under the supervision of W. H. Lyne, Inspector of Imported Fruit and Nursery Stock. The Provincial Fumigation and Inspection Station is situated in the City of Vancouver. All importations of nursery stock, trees, plants, etc., have to come direct to Vancouver, where they are thoroughly inspected by our officials. If found free from disease they are forwarded without delay to destination. If found infected with any serious disease or pest they may be destroyed or fumigated as occasion demands. A rigid system of inspection is maintained, and by this means the Province undoubtedly has been safeguarded from the

Corn-field near Nanaimo, B.C.

British Columbia wheat-crop. Averages 27.57 bushels per acre.

Model dairy-farm, Vancouver Island.

Good stand of corn near Victoria, Vancouver Island.
Thirty tons to the acre.

introduction of the most serious pests which have worked such havoc in other countries and been the cause of great economic loss. Inspection is maintained on all importations of corn, rice, grain, etc., and fumigation, when necessary, undertaken both at Vancouver and Victoria. Quarantine officials have been appointed at all points of entry into the Province, and a careful watch is kept on all importations of fruit and vegetables from United States points, so that the Province may be protected from the introduction of codling-moth, San Jose scale, and any other injurious pest or disease. Through an arrangement made between the Federal and Provincial Governments, the Province undertakes the work of enforcing the provisions of the Dominion "Injurious Insect and Pest Act," which provides for inspection at Vancouver. Previous to this arrangement a double inspection was carried on at Vancouver, and it was in order to do away with this unnecessary duplication of work that this arrangement was made, which is satisfactory to all parties concerned.

STATISTICS BRANCH.

The work of this Branch, under the direction of A. B. Tweddle, Statistician, has been actively carried on during the year, and as complete data as possible have been secured with regard to agricultural products and importations, both dutiable and from other Provinces of the Dominion. This information was collected in accordance with an arrangement made between the Federal and Provincial Statistics Departments, and in this way unnecessary duplication of work which heretofore existed has been to a large extent eliminated. R. H. Coates, Dominion Statistician and Controller of Censors, sent out forms which had previously been approved by us to 19,300 farmers in the Province whose names appeared on our voters' lists. The forms when filled in by farmers were then mailed to our Provincial Statistics Branch. The information was then compiled for our own use and afterwards forwarded to Ottawa for inclusion in Dominion statistics. The response from farmers was encouraging, replies being received from approximately 7,000. Taking into consideration the fact that many of our farmers as a result of the war have left the Province, and that in many cases there appeared on the voters' lists several names, all of which represent members of the same family and living on the same farm, the response from our farmers may be looked upon as eminently satisfactory. The data so secured are carefully checked by means of information secured by our officials of the Horticultural and Live Stock Branches, and by the personal canvass of Mr. Tweddle, additional information is also secured from the outlying districts in Central British Columbia and the Peace River country from reliable resident farmers. Unless statistics are reliable they lose their value, but I am convinced that by means of the methods adopted by us, and the checking system which we have, the accuracy of our figures will bear favourable comparison with those of any other Province in the Dominion.

LEGISLATION.

"*Brand Act.*"—Under the supervision of the Recorder of Brands, the registration of brands throughout the Province has been effected and the duplication of brands that previously existed has been remedied. An inspection is maintained by our Inspectors at the principal shipping-points for cattle, horses, and hides, and a much-needed protection has been thereby afforded to stockmen of the Interior.

"*Dairies Regulation Act.*"—Under the provisions of this Act, official testers are licensed after having passed an examination held by our Provincial Dairy Instructor. Two official testers have also been appointed and are paid by the Department, who are stationed at Vancouver and Chilliwack. These men test all samples of milk and cream sent in by farmers, thus ensuring that they will receive equitable treatment and be paid strictly in accordance with the butter-fat contents of their milk or cream.

"*Sheep Protection Act.*"—In accordance with the provisions of this Act, a sheep-protection district has been established taking in the territory from Campbell River in the north to the south end of the Island, including all adjacent Gulf Islands, the western boundary being the line of the Esquimalt & Nanaimo Railway. All owners of dogs within this district are required to pay a licence fee of $1 for a male and $2 for a female. All dogs must also carry a metal tag for identification. The formation of this district will do much to remove the dog nuisance which has in the past militated so adversely against the extension of the sheep-raising industry. The administration of this Act is vested in the Superintendent of Provincial Police.

"*Agricultural Act.*"—By the amendments made to the "Agricultural Act" at the last session of the Provincial Legislature many important improvements in the administration of the Act have been effected. Provisions are made for the payment of a *per capita* grant to Farmers' and Women's Institutes in accordance with the membership fee, and for the formation of district institutes, which will tend towards a better and more effective co-ordination of our institute-work. Each institute district will have the appointment of a member on the Advisory Board.

"*Eggs Marks Act.*"—Much good has been accomplished by the operation of this Act. By its provisions all dealers in eggs are required to plainly indicate by means of a placard placed on all containers the grade of the eggs offered for sale, whether imported, storage, or fresh, and all restaurants or public eating-houses must, if they use Chinese eggs, prominently display a legend to that effect. A number of convictions for violations of this Act were secured in the Cities of Vancouver and Victoria during the past year, and dealers are now generally observing the provisions of the Act. All Provincial and municipal police, our Poultry Instructors and Markets Commissioner in Vancouver have been appointed Inspectors under the Act.

Farmers' Institutes.

For the first time since the inception of this important movement Farmers' Institute membership shows a material decrease. This is altogether owing to the fact that many hundreds of our members have responded to the call of Empire and are serving their country at the Front or in other lines of war-work. Interest in the work has, however, been well maintained, and many of our institutes are now strong organizations doing excellent co-operative work in the purchasing of supplies for members on a wholesale basis, thus tending towards economy in production. More appreciation of the efforts of the Department on behalf of farmers is being shown, and more willingness to take advantage of the assistance and facilities offered institute members by the Provincial Government. The number of incorporated institutes is now 148, with a membership of approximately 8,000.

Women's Institutes.

It is gratifying to be able to record a year of good progress in Women's Institute work. Membership, in spite of present conditions, shows a material increase over the preceding year. Several new institutes were formed in 1917. There is no doubt but that many improvements in the conditions affecting women in our rural districts have been brought about by their agency. All the efforts of our Women's Institutes have been concentrated on patriotic and war work, and I gladly take this opportunity of expressing my admiration for the noble and unselfish national services of our institute women, which have been directed towards the alleviation of suffering and distress in war-stricken Europe. Field comforts for our fighting forces, supplies for our hospitals, food, clothing, and cash contributions for the European countries overrun by the Kaiser's hordes, food for our prisoners of war, etc., have been generously and willingly supplied by institute members. I also take this opportunity of expressing my appreciation of the work so capably carried on by members of the Advisory Board of Women's Institutes, to whose initiative is largely due the success which has attended this important organization of the women of our rural districts. There are now fifty-nine incorporated Women's Institutes in the Province, with a membership of over 3,000. The personnel of the Advisory Board for the year 1917 was as follows: Mrs. J. Johnson, Nelson, Chairman; Mrs. W. V. Davies, Chilliwack, Secretary; Mrs. Blackwood-Wileman, Duncan, V.I.; Mrs. R. L. Lipsett, Summerland.

Conferences.—Four annual district conferences of Women's Institutes were held in the months of October and November at the following places: Cranbrook, Vernon, Mission, and Duncan, V.I. I had the privilege of attending three of these conferences, being unable to be present, through unavoidable circumstances, at the Mission conference, and it gives me pleasure to testify to the unqualified success that they were. The attendance was splendid, interest well maintained throughout, and addresses and papers of a high order of merit given and read. The interchange of ideas and discussions on institute-work between delegates must tend towards better and more effective work and closer co-operation between institutes. "Patriotism, production, and conservation" was the key-note of all conferences, and delegates went back to their homes determined to preach this gospel in their institute district to the fullest extent.

Agricultural Journal.

A monthly *Agricultural Journal* is issued by the Department and supplied free to all members of Farmers' and Women's Institutes where the annual membership fee is $1. This *Journal* is purely a farmer's magazine containing timely hints and articles by expert officials of this Department, members of the staff of the British Columbia University, and officials of the Federal Department of Agriculture, as well as by farmers. This *Journal* has a wide circulation amongst our farmers and is generally well appreciated by them.

Agricultural Associations.

Out of a total of sixty-seven Agricultural Associations, forty-five held their annual fairs in 1917, with, on the whole, satisfactory results. Whilst there was a falling-off in the number of entries, due to the fact that farmers have to work early and late on their places and experience great difficulty in getting any assistance, the quality of the produce and live stock exhibited was generally good, and a marked improvement was noticeable in the majority of instances in the arrangements made by the fair managements for placing exhibits. The Department supplied judges for all the fairs held, the majority of whom were departmental officials. It was often necessary, however, owing to the number of fairs that were held, and to the fact that many of them were held about the same time, to get some outside assistance. The judges were instructed to carry out educative work at all the fairs in the way of explaining the reason for their awards. Much valuable work is accomplished in this way.

Provincial Associations.

British Columbia Fruit-growers' Association.—This association has had a year of good progress and has been active in its efforts to further the interests of fruit-growers. The work has been under the direction of President Barnes, backed up by a capable Executive. Professor Clement, of the Provincial University, acted as Secretary, filling the position rendered vacant by the resignation early in the year of R. M. Winslow, Provincial Horticulturist. The association is to be congratulated in procuring the services of Professor Clement, who has worked constantly to advance the aims and objects of the association. The main activities of this organization have been directed towards the most efficient advertising and marketing of the fruit and vegetable crop. Good work has also been done in the way of securing from the freight and express companies more just rates. The association published a capital booklet on the British Columbia apple, which was widely distributed throughout the Prairie Provinces and elsewhere, and proved a very good advertising medium for our British Columbia fruit. A very successful annual convention was held early in the year, which was attended by representative growers from all the fruit districts of the Province. Many matters of interest were fully discussed, and there is no doubt but that good and practical results are obtained by a mutual interchange of ideas on the part of fruit-growers.

British Columbia Stock-breeders' Association.—Material assistance has been given to importers of pure-bred stock by this association, which granted a rebate of half the transportation charges on all shipments of pure-bred stock, either imported or moved from point to point within the Province. This association has done a good deal towards encouraging breeders to use pure-bred sires and to encourage the sound principle of breeding from selection. A Breeders' Directory, which must prove of great use and assistance to stockmen, was published by the association and distributed to its members in the Province and elsewhere. A successful annual convention was also held.

British Columbia Dairymen's Association.—The British Columbia Dairymen's Association has enjoyed one of its most successful years during 1917, and it is satisfactory to see that a widespread interest is being taken in the problems of the dairy-farmer. The membership of the association is steadily increasing and its sphere of usefulness continually widening. The annual convention of the association held at Nanaimo in January, 1917, was most successful, both from the point of attendance and from an educational point of view. An extra convention was held in Kelowna in June for the benefit of the dairymen in the Okanagan. This was also largely attended, and it is safe to say that the stimulus given to the dairy industry by reason of these conventions will not soon be forgotten. The policy of the association has been, as in previous years, to utilize its grant from the Government in the carrying-on of contests, competitions, and other activities that would have an educational value and encourage the industry.

British Columbia Poultry Association.—The British Columbia Poultry Association, through its central organization and local associations, has tended largely to promote and standardize the poultry industry by the help of shows and by offering special prizes at the International Egg-laying Contests. The publication of the annual Breeders' Directory has been a great aid to poultry-breeders throughout the Province. The annual poultry fairs held under the ægis of the association were very successful, and the exhibits were of a high order, a marked improvement in the quality of the birds exhibited being noticeable.

British Columbia Goat-breeders' Association.—The British Columbia Goat-breeders' Association has just concluded its first year, which has proved a very satisfactory one, and the fact that the membership reached the total of 176 shows that there was need for such an association to co-ordinate and direct the development of the industry. The work done during the year includes assistance to importers of pure-bred stock by refunds of freight, which has helped members to bring some fine stock into the country, and helped towards a successful exhibit of milk goats at Vancouver Fair, a campaign of education as to the value of milk goats and their products, and various other minor activities. With the co-operation of the Dominion Government, pure-bred registry was inaugurated for goats, and a representative of the Live Stock Commissioner at Ottawa spent some months in the Province inspecting milk goats and recording them as foundation stock, from which it is hoped to build up a successful industry.

British Columbia Bee-keepers' Association.—This association is growing rapidly and has now a very good membership. It is doing good work in the way of encouraging right methods of bee-keeping amongst its members. A most gratifying exhibit was staged by the association at the Vancouver Exhibition, which attracted a great deal of interest and favourable comment, and which was generally a fine educative exhibit. It is an interesting and, if properly managed, a lucrative side-line of farming and is rapidly increasing throughout the Province, and before long British Columbia will be exporting honey. The quality of the honey produced in many of our districts cannot be excelled, and the average production per hive bears very favourable comparison with any other honey-producing country.

Vancouver Island Flockmasters' Association.—This association reports a year of progress. In addition to the placing of pure-bred rams in the different districts of Vancouver Island and adjacent Gulf Islands for the improvement of flocks, the grading and classification of wool is also undertaken, and as a result higher prices have been obtained. The wool is sold by the association on a co-operative basis after it has been properly graded and packed.

FEDERAL GRANT.

By means of the moneys granted the Provincial Department of Agriculture under the terms of the Dominion "Agricultural Instruction Act" it has been made possible for us to greatly extend the scope of our educative activities. A portion of this grant is used towards the appointment of Instructors and Inspectors, and several of our agricultural experts have been appointed under this section. The following lines of work are also taken care of by this Federal appropriation: The operation of field-crop demonstration stations, dry-farming demonstration stations, horticultural demonstration stations, poultry demonstration stations, and egg-laying contests; alfalfa-plots, silo-construction work, drainage demonstrations, seed distribution and co-operative variety tests, seed production; Cow-testing Association work; bee-keeping; field-crop competitions; Boys' and Girls' Clubs; fruit-packing schools; market-work; pathological and entomological investigation and research work; weed investigation; and, in addition, the whole work of compilation, editing, and printing our monthly *Agricultural Journal.* By means of the policy of the Federal Government in making appropriations to the different Provincial Governments for carrying on various lines of educational work we are enabled to undertake these valuable lines of instructional and educational work, which undoubtedly has proved of the utmost benefit to our agriculturists throughout the Province. The supervision of expenditures of this grant by the different Provinces is undertaken by Professor W. J. Black, Commissioner of the "Agricultural Instruction Act," Ottawa. Valuable advice and assistance towards the wisest and best expenditure of this grant has always been freely given by Professor Black, and it is with great pleasure that I express the thanks and appreciation of our Department for his kindly help. The moneys are expended in accordance with an agreement made at the beginning of each fiscal year between the Dominion and Provincial Ministers of Agriculture.

Pioneer farmers in the Bulkley Valley.

A dairy-farm in the Salmon River Valley, near Prince George.

Board of Horticulture.

Two meetings of the Provincial Board of Horticulture were held during the year and various matters dealt with, viz.: Inspection of nursery stock, trees, plants, fruits, etc., and the fumigation of imported rice, corn, and grain. The following is the personnel of the Board: J. C. Metcalfe, Chairman; W. C. Ricardo, K. R. Streatfield, C. F. McHardy, R. M. Palmer, A. J. Woodward; W. E. Scott, Deputy Minister of Agriculture, and Hon. John Oliver, Minister of Agriculture, ex officio.

Appreciation.

In concluding my report, I take the occasion of expressing the thanks of the Department to the Canadian Pacific Railway, Canadian Northern Railway, Grand Trunk Pacific Railway, Pacific Great Eastern Railway, Kettle Valley Railway, and the Esquimalt & Nanaimo Railway for their courtesy in affording transportation privileges to those officials of the Department who in the discharge of their official duties have to travel through the various farming districts of the Province. This concession has greatly facilitated our work amongst the farming communities.

It is with pleasure that I bear testimony to the capable way in which the officials have administered the work of the various branches and divisions for which they are responsible, and for the loyal co-operation and work of all other members of the staff.

A Tribute.

The Department of Agriculture pays a tribute to those gallant men, former members of the staff, who have made the supreme sacrifice on the battle-fields of Europe, and who died like loyal Britishers fighting for the cause of freedom against oppression and wrong: Captain Norman S. Payne, Accountant; Lieutenant Bernard Shipton, Fruit Inspection Branch; Flight-Lieutenant Charles Rayner, Fruit Inspection Branch.

All of which is respectfully submitted.

Wm. E. Scott,
Deputy Minister and Superintendent of Institutes.

REPORT OF PROVINCIAL HORTICULTURIST AND INSPECTOR OF FRUIT PESTS TO JULY.

R. M. Winslow.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I have the honour to report on the work of the Horticultural Branch for the period January 1st to July 7th, 1917, which is my final report as Provincial Horticulturist and Chief Inspector of Fruit Pests.

Scope of the Horticultural Branch.

My report covering 1916 can serve very well under this subject for 1917. The policy followed during the year is essentially the same as that of last year. In many lines the work is being being somewhat extended; in others reduced.

Changes in Staff.

The period which this report covers is marked by an unusual number of resignations, for various causes. These resignations have necessitated changes. E. W. White, Inspector for Vancouver Island, took over the whole of the Branch work on the Island and part of that on the Lower Mainland. H. H. Evans was appointed Inspector, under P. E. French, vice R. J. Kyte. J. A. Grant, of Victoria, was appointed Prairie Fruit Markets Commissioner, vice W. E. McTaggart. E. C. Hunt, Acting Assistant Horticulturist, Grand Forks, was given charge of the Kootenay territory as well as his own. On January 2nd C. P. Pearson was appointed Secretary, vice B. Whittaker, who resigned on December 18th. J. Tait, Inspector for Summerland in 1916, was re-employed on March 1st.

Needless to say, these numerous changes have made it extremely difficult to carry on the work of the Horticultural Branch with even a reasonable measure of efficiency.

ORCHARD VISITS AND DEMONSTRATIONS.

This line of work, which is one of the most valuable and most appreciated of all activities of the Branch, was continued in 1917, but in all districts there is less of it than usual because of the reduced staff.

PRUNING-SCHOOLS.

A total of twelve pruning-schools was held during the winter of 1916-17, as shown in Appendix No. 1. The number of these pruning-schools was smaller than usual: Firstly, because a very large proportion of the fruit-growers and orchard-helpers of the Province have now been pupils of these schools; and, secondly, because the great shortage in help through the fruit districts made it impossible for many, who would otherwise have attended, to give the necessary week to this work. It is a satisfaction to say, however, that the general class of tree-pruning throughout the Province has greatly improved since the pruning-schools were started, and the deficiencies in pruning methods which may now be observed are much more largely due to lack of labour than want of knowledge.

PACKING-SCHOOLS.

This Branch has just concluded a series of sixty packing-schools, which is the largest number ever held in one season. The fruit districts were very short of packers in 1916, and expect a considerable increase in crop in 1917, for which a large number of new packers had to be trained.

Arrangements were also made with the Education Department under which they paid the cost of six-lesson periods of instruction to the pupils of high schools and of the fourth grade in public schools; twenty-eight of the schools were of this type. The Agricultural Department supplied the Instructors and carried on all of the work after the applications were received by the Education Department. The plan worked very satisfactorily, and from many districts it has been heard that the school pupils averaged up well, and will probably save the situation with respect to packing in the season of 1917.

From Appendix No. 2 it will be noted that the pupils totalled 1,037, with an average proficiency of 84.5 per cent.

CROP ESTIMATES.

The Horticultural Branch has already issued a preliminary estimate on the various small-fruit crops. A further report on small fruits and a preliminary report on tree-fruits will be issued as soon as possible; at the same time, there will be a preliminary report on the acreage of vegetables and their condition. The various members of the Horticultural staff have co-operated with the Statistics Branch of the Department in securing field-crop and live-stock reports in their districts. In the Lower Mainland District the Inspectors under the Coast Markets Commissioner paid visits to over 900 potato-growers, taking records of their acreage and varieties, soil conditions, seed-treatment, etc. This will be most valuable information in moving the 1917 potato-crop in the fall.

INSPECTION AND PEST-CONTROL WORK.

This work was continued during the present season along very much the same lines as those followed in 1916.

INSPECTION OF POTATOES FOR EXPORT.

The movement of potatoes from January 1st into May was very heavy. Mr. Abbott's reports show a total of 943 cars and 268 sacks inspected and passed for export or for Eastern Canadian points since January 1st. The condemnations for the same period totalled 341 cars and 150 sacks. Your Horticulturist is more than ever convinced of the extreme value of this work in establishing a desirable reputation and permanent markets for British Columbia potatoes.

NURSERY INSPECTION.

At all of the nurseries of the Province the necessary inspection of stock for spring shipment was made. In many cases it was possible to give the nurseries, after general inspection, a release form permitting shipment of the whole of the stock; in other cases it was necessary to give detailed inspection with a view to preventing shipment of diseased or injured trees.

All nurseries are required to be bonded and licensed under the Act. This Branch has pushed this matter vigorously and is pleased to report that it is now in much more satisfactory shape than it has been hitherto.

Codling-moth.

Okanagan Landing.—The work commenced in this district in 1916 was continued. Three power outfits were operated, and it is proposed that, if justified, three sprays be applied during 1917. On request of this Department, R. C. Treherne, of the Dominion Entomological staff, was giving his time as far as possible to the codling-moth work during the codling-moth season. The result of his investigations as to life-history details will, of course, govern our spraying programme. The first spray has been already put on and all of the old bands reinspected.

Westbank.—The same general plans as apply at Okanagan Landing apply at Westbank. At the latter point the infection was comparatively slight, and the work of 1917, followed through vigorously, should bring the codling-moth very close to eradication.

Walhachin.—Quarantines have been placed on the orchards in and near the area known to be infected. The trees have been pruned under our direction and the first spraying has already been applied. The conditions in this district are very favourable for a quick clean-up and good results should be had.

Thrips-control on Vancouver Island.

This work has been continued along the lines of the previous season, except that the power outfit at Gordon Head was operated by the growers themselves. The results are apparently very satisfactory. General improvement in the condition of the orchards, which have now been sprayed for two years, is very well marked and is having good effect in promoting general spraying.

It is now well established that the thrips can live and reproduce on the common maple and possibly on other native plants; this further establishes the contention that the thrips is here to stay. The two years' work have, however, shown amply that it can be controlled by methods well within the reach of commercial fruit-growers.

Black-currant Bud-mite.

R. Glendenning was again employed during last spring to inspect black-currant plantations on Vancouver Island. His report shows greatly reduced infection as a result of the 1916 season's work, and during the present season he secured the destruction of a number of bushes found to be infected.

As far as the cultivated black currants are concerned, we are satisfied that the policy followed will, if continued for another year, result in eradication. Mr. Glendenning has, however, just reported that he has at last discovered the mite well established on the native currant; this being the case, eradication is no longer possible.

Fire-blight.

Throughout the winter of 1916-17 your Inspectors and Assistant Horticulturists in the fruit districts have worked vigorously to secure a complete clean-up of the over-wintering blight-cankers. This has taken a large amount of orchard-to-orchard visitation, some cases requiring as many as three or four visits. However, a very good degree of co-operation has been had from the growers, and there have been no cases where it was necessary to adopt any measures stronger than persuasion.

At the present time the amount of blight in the Province is very slight indeed; it has been less, in fact, than in any year since 1912.

Institute and other Meetings.

A large number of meetings were held throughout the fruit districts during the latter half of February and the month of March; these meetings were addressed by various members of the Horticultural staff. The attendance, as a rule, was excellent. A number of other meetings and demonstrations have been held at various times.

Demonstration Orchards.

A certain amount of supervision to the orchards at Nanaimo, Hammond, Birchbrook, Rossland, New Denver, Wardner, Baynes Lake, and Windermere is being continued. The Department also did some replanting in the orchard at Lower Nicola, replacing winter-killed trees. In some of these cases the agreements have not yet expired, and in others it seems desirable, in the interests of the districts served, that supervision be continued for another year or two at least.

EXPERIMENTAL STATION AT SUMMERLAND.

The small-fruit and vegetable experiment station at Summerland, operated under the direction of this Branch by J. L. Hilborn, is being continued in 1917 on lines similar to those of previous years.

The strawberry-plot at Hatzic is also being continued and should give valuable results in 1917 in the way of different varieties being tested.

NORTHERN EXPERIMENTAL PLOTS.

Following the resignation of A. R. Neale, Acting Assistant Horticulturist, Prince Rupert, the Department decided to discontinue the operation of the plots at Terrace and Lawn Hill, operating only that at Bella Coola.

HORTICULTURAL CROP COMPETITIONS.

The number of crop competitions of which the Horticultural Branch has had charge totals thirty in 1917, as against twenty-four the previous year. Most of these competitions have already been judged by officials of the staff for the first time; all are to be judged twice, and in some cases a third judging will be given.

The competitions are classifiable as follows:—

Kind of Competition.	No.	Place.
City garden	5	Victoria.
„	2	Maywood and Lynn Valley.
„	1	Nelson.
Farm garden	14	Sooke, Metchosin, Penticton, Natal, Robson, Needles, Harrop, Wynndel, Hammond, Nicola, Crawford Bay, Baynes Lake, Willow Point, and Mara.
Orchard, bearing	3	Notch Hill, Grand Forks, and Willow Point.
Onion	1	Kelowna.
Strawberry	3	Maple Ridge, Saanich, and Gordon Head.
Raspberry	1	Maple Ridge.

EXPERIMENTS IN SPRAYING.

The apple-scab spraying experiments of 1916 were continued; in addition to the plots at Vernon, Kelowna, Samlon Arm, Nelson, and Creston, a plot is being operated at Edgewood for the Arrow Lakes District. Numerous other experiments are being conducted on the control of insects and diseases. The experiment on apple-tree anthracnose on Vancouver Island shows remarkably good results.

APPLE-STORAGE EXPERIMENTS.

The six years' tests of the cold-storage capabilities of different varieties of British Columbia apples in different districts were concluded in June, 1917. Under instructions, H. Thornber has taken possession of all of the material with a view to preparing a final report and also a short summary of the same, the latter for publication and the former to be made available to those few who would be most directly concerned.

PRAIRIE MARKETS COMMISSIONER'S WORK.

Mr. McTaggart's resignation, as above recorded, made necessary the appointment of the new Commissioner, J. A. Grant, of Victoria, who took charge on April 15th, and has since been engaged very largely in getting acquainted with the fruit districts of this Province and of the North-western States and in visiting various Prairies centres. The series of weekly reports started on June 16th.

COAST MARKETS COMMISSIONER'S OFFICE.

Mr. Abbott and the staff have been engaged principally, since the beginning of the year, on potato-inspection work, shipments, and the instruction to potato-growers on the selection and disinfection of seed. Mr. Abbott's annual report will, however, go fully into these activities.

British Columbia Fruit-growers' Association.

The Horticulturist, as Secretary of this association, devotes a considerable share of his time to this work. The membership for the current season is being well maintained, the total up to date being 486 and eleven life members.

The Secretary made all arrangements for the annual meeting, and also arranged and attended two Directors' meetings, five Executive meetings, and several other committee meetings. The annual report was prepared for publication and a price-list of spray materials was issued. The association and the Department, in conjunction, have worked to advantage in securing low railway rates for the movement of fruit-harvesters from the Coast cities to the fruit districts, and have also been of assistance in organizing the labour of women and children in Vancouver, etc., so as to make it available. A good deal of the Secretary's time has been devoted to correspondence in connection with the British apple embargo and the preparation of the association's case in that respect.

A full report of the association's work, with financial statement, will be submitted to the Department in due course.

All of which is respectfully submitted.

R. M. Winslow,
Provincial Horticulturist and Inspector of Fruit Pests.

REPORT OF PROVINCIAL HORTICULTURIST AND INSPECTOR OF FRUIT PESTS.

M. S. Middleton.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I have the honour to submit herewith my ninth annual report as Assistant Horticulturist for the Kootenay and Boundary Districts, and my first report on the work of the Horticultural Branch for the period from July 7th to the end of the year 1917 as Provincial Horticulturist and Inspector of Fruit Pests.

Activities.

The general work of the Horticultural Branch has been carried on along somewhat similar lines to those conducted by my predecessor, R. M. Winslow, resigned, with the exception that the Secretaryship of the British Columbia Fruit-growers' Association was taken over by Professor F. M. Clement, of the University of British Columbia. This change has enabled the Provincial Horticulturist to give more detailed attention to the very important work of his Branch in the office and in the field. It has allowed and encouraged a more personal working connection between the Horticultural Branch and the growers and growers' agencies, etc., throughout the Province. An opportunity was permitted to get out and get in touch with conditions, and so acquaint myself with the actual needs and demands of the work. At the same time, the heartiest co-operation has been encouraged between the Secretary of the British Columbia Fruit-growers' Association and this Branch, your Horticulturist being added as an ex-officio member of the Executive and Directorate of the British Columbia Fruit-growers' Association.

Co-operation with and co-ordination of the work of the Horticultural Branch with that of the other branches of the Department and the Dominion officials in the Province have been aimed at, and at least some progress made towards this end. A working understanding between the Provincial Pathologist and the Acting Provincial Entomologist has been agreed upon, in that the officials of this Branch work with and under their guidance in pest-control work, etc.; the officials of this Branch to receive all local credit in their respective districts, while the co-operating heads receive all Provincial credit for the work carried out. This arrangement has met with very pleasing appreciation from all concerned.

The general work of the Branch need only be mentioned as consisting of all duties in connection with fruit and vegetable crops, special attention being given to the successful growing of same, control of pests, etc. The proper marketing of the crops has also been well taken care of, and every assistance given by the Markets Commissioners towards holding our present markets and extending them wherever opportunity offered.

OFFICIALS.

Assistant Horticulturists.—These men are all doing horticultural and fruit-pest inspection-work, which includes inspection of orchards for diseases and insect pests, and the control of same; conducting of demonstration spraying in the control of pests; inspection of all exports in the way of fruit and vegetables to foreign countries; inspection of foreign cars for insect pests, etc., and general assistance to the fruit and vegetable growers in the district; and, at the same time, the collection of data as to crop statistics in their particular district.

Markets Commissioners.—The main work of the Markets Commissioners is to keep in touch with the markets and to encourage the shipping of the products in most demand in these markets, and to give advice of the arrival of the same, and, generally, to assist the British Columbia shipper in marketing his produce to best advantage.

DEMONSTRATION FIELD-WORK.

Realizing the importance of personal orchard visits and discussions on the spot, this line of work has been continued and encouraged as far as possible, but, owing to the great reduction in the staff as compared with former years, along with the growth of the industry, it was impossible to visit every orchard in each section. It is, however, pleasing to state that, by energetic work on the part of the Inspectors, the majority of the most urgent calls were made and main orchards visited at some time during the year. It was impressed on all fieldmen that, during the war, only the most urgent and necessary work should be carried on, and at the least expense consistent with efficiency. This practice has been followed out.

PRUNING AND PACKING SCHOOLS.

The pruning and packing schools held during the late winter and early spring were fully reported on by my predecessor, and nothing further need be added, except to state that the expression of opinion on the results obtained by these classes warrants their continuation, at least, on somewhat modified lines.

FARM SURVEY AND STATISTICS.

During 1916 a very thorough survey of the fruit and vegetable sections of the Province was made by practical and painstaking enumerators. This work is being followed up by a card-filing system, whereby every grower will be numbered and a record of his place kept, including acreage in different crops; number, variety, and age of trees, as well as cultural methods and results, in such a way that it can be seen at a glance. These cards will be made effective for five years by additional data from notes entered in a pocket loose-leaf field-book, which will show all annual crops, new plantings, replacements, or losses, as well as yields which may occur from year to year. This work is being undertaken with a view to co-operating with the Statistical Department, so that better, fuller, and more accurate information may be available.

In co-operation with the Departmental Statistician, crop estimates and reports have been furnished from time to time during the growing season by the members of this Branch, and these have been followed up by a detailed, accurate report at the end of the season, showing the actual shipments which have been made during the year. In this way the work of the Statistical Branch is greatly assisted, not only by way of material for a quick preliminary report, but the enumerators having the knowledge and interest of their districts at heart, it naturally follows that more accurate information is obtained. The Horticultural Branch, in turn, benefits by the systematic compilation by the Statistician of all the available information and data relative to fruit and vegetable crops. Information and data are also gathered in a similar way each year from the various jam, canning, and evaporator plants in the different parts of the Province; this is a very valuable and useful information for each official in his own district, and can be obtained easily and accurately by him.

INSPECTION-WORK.

Inspection constitutes one of the most important phases of the work of this Branch. It consists of prevention of the introduction of any serious pest in the Province or any section; inspection of all nurseries and nursery stock grown in the Province; the control or eradication of any pest within the Province; the inspection and certification of export shipments of both

fruit and vegetables; the protection of our markets, and, at the same time, encouragement in the production of cleaner and better crops. In all this work acknowledgment is due to the hearty co-operation of the various branches of the Provincial Department of Agriculture, the Inspection of Imports Branch, the Plant Pathologist and Entomologist, the Dominion Department of Agriculture officials, and the shippers and growers.

Inspection of Foreign Empty Cars.—One of the greatest sources of infection from codling-moth is, without doubt, through the foreign railway-cars brought into the Province from the codling-moth infested areas in the United States. These cars are all inspected at central, divisional, or icing points; all rubbish is cleaned out and burned, a thorough inspection given, and the cars iced several hours before loading. As an instance of the importance of this work, this year no less than fourteen healthy, full-grown larvæ were discovered in one foreign car at Okanagan Landing.

Inspection of Nurseries.—A most careful preliminary, summer inspection is given to nurseries in the Province; this is followed up by a thorough tree-to-tree inspection at the time of digging, and after they are dug, or, at least, before they are shipped out; all inferior, infested, or infected stock is destroyed. Woolly aphis, crown-gall, hairy root, and winter injury were the main sources of condemnations. This is the only safe way of protecting the growers and the Province against the possible introduction or spread of any serious pests, and the varying results towards success due to planting inferior stocks.

The nursery business has not been as active as usual during the last few years; a goodly number of firms have gone out of business, or have discontinued propagating fruit-trees and fruit-plants, and are giving their attention to the ornamental business and floral trade. This accounts for the laxity to take out the nursery bond and licence under the "Agricultural Act, 1915," Part VII. The demand for nursery stock in 1918 will be a great improvement over the last few years, due to the successful year experienced by the fruit-growers. A great many soft fruits, such as apricots and peaches, will be planted, and a number of the winter-injured varieties in some districts will be replaced by more adaptable sorts.

Codling-moth.—The quarantine areas at Westbank, Okanagan Landing, and Walhachin were given close attention during the season, and we are able to report encouraging results in the reduction of worms to about 10 per cent. of last year's number. At Okanagan Landing the area has been greatly reduced, so much so that negotiations are being considered to destroy all the fruit in the two remaining orchards with a view to eradicating the pest in this section. The work will be carried on at Westbank and Walhachin as in previous years, viz.: All trees will be banded and several band inspections made during the larvæ and pupa periods, and two and three sprayings given; all the older trees scraped to remove their rough bark; all the fruits inspected thoroughly, all wormy and cull fruit being destroyed by boiling, and the good fruits, after close inspection, shipped out of the Province.

San Jose Scale.—No new infested areas were found and the infested orchards at Spences Bridge have been cleaned up successfully. Some infestation was found on the choke-cherry at this point and careful attention is being given to its eradication.

Woolly Aphis.—This pest is on the increase, particularly in the Okanagan Valley; every effort will be made this coming season to assist the growers in controlling it.

Pear-thrips.—This pest, which gained such a thorough foothold on the southern end of Vancouver Island some few years ago, and on which the Provincial Horticultural Branch, in co-operation with the Dominion Entomological Branch, carried out very successful work during the past two years, has by demonstration proven to be easily and successfully controlled by spraying. It has been discovered that this insect pest is not dependent upon our common deciduous fruit-trees, but may be found working on the maples, willows, choke-cherries, and even on the Douglas fir, and on many of our common shrubs and plants, so that the possibility of eradicating it is out of the question. However, its life-history has been exhaustively worked out by the Dominion Entomologists, and the practicability of spraying for its successful control has been fully demonstrated, so that we need have no anxiety in this connection. E. W. White's report deals with this pest in detail, and for still further reference it might be noted that a Dominion bulletin is about to be issued on the pear-thrips work on Vancouver Island.

Black-currant Mite.—Infestation in the Duncan District by this pest was well taken care of by Mr. Glendenning, whose report may be referred to. Discovery of the pest on the wild currant places a serious phase on eradication possibilities.

Strawberry-root Weevil.—This pest was troublesome in the strawberry sections of Vancouver Island and on the Lower Mainland, but growers are experiencing that it can be kept in check by following the preventive measures as advised by the Government officials—viz., rotation, short-cropping system, and delaying the ploughing-down of the patch until the insects have laid their eggs.

Peach-twig Borer.—This pest is on the increase and has caused considerable loss to growers in the southern end of the Okanagan Valley, particularly in apricots and peaches. A survey is at present under way to ascertain the number of trees, their age, size, the spraying equipment owned or available, with a view to encouraging a community effort for successful control. A campaign will be worked out along educative and gentle persuasive lines towards controlling the pest, but in some cases more drastic measures may have to be resorted to with some of the neglected or absentee orchards.

Grasshoppers and Wireworms.—During 1917, grasshoppers did great damage in some sections, particularly at Kelowna and Midway. Excellent results were obtained at Kelowna by using the Kansas mixture, as per Mr. Hoy's report.

Wireworms were also numerous and troublesome in the Kelowna section in 1917, and experiments were carried on by Mr. Hoy at Kelowna, using rice, bran, and molasses as a trap for the worms, with very satisfactory results.

Fire-blight.—Generally speaking, those districts where blight-infection was so bad in the past look very encouraging. The shortage of labour for this particular work has affected its control and possible eradication. The inspection for hold-over cankers of this disease is carried on during the winter months, and very excellent results through the efforts of this Branch can be reported. It is a matter in which the majority of the work has of necessity to be carried out by the growers themselves, but at the same time a great deal of assistance in locating and cutting out the blight is being rendered by our fieldmen. Blight showed up quite badly in the Armstrong, Vernon, Kelowna, and Grand Forks Districts in 1917, and extra efforts are being exercised by our men in these sections; other sections show greatly improved conditions.

Apple and Pear Scab.—Apple-scab was not as prevalent during 1917 as in previous years. Our scab-control work was carried on as usual with equally marked success at Salmon Arm, Vernon, Kelowna, Needles, Nelson, and Creston; some conbination pear-thrips and scab sprays were also used on Vancouver Island with excellent results. Comparative tests with different spray materials and mixtures were carried on by Mr. French at Salmon Arm. Locality tests were carried on at Salmon Arm and Vernon, and, in addition, different strengths of lime-and-sulphur solution for scab-control were tested out at Vernon. The detailed results are contained in Mr. French's report. At all the different points above mentioned the three-year test-plots for scab-control were continued on the same trees, and the continued striking success was obtained with lime and sulphur at different times during the scab-infection season. For further details refer to the reports of Assistant Horticulturists.

Apple Anthracnose.—This disease has become quite serious in the moist Coast sections. Fall spraying with Bordeaux mixture at different times was again carried on in 1917 at Keating with very good results.

Peach-mildew and Leaf-curl.—Owing to seasonable conditions these diseases were not troublesome, and sprayed plots showed no marked results over non-sprayed ones.

Potato-diseases.—Late blight of potatoes, particularly in the Lower Mainland districts, was extremely prevalent during 1917; in some cases where inspections were made as high as 80 per cent. of the tubers were found to be infected. Other common potato-diseases were common scab, *Rhizoctonia*, and *Fusarium* wilt. Owing to the scarcity of good seed in the spring of 1917, much infected stuff was planted, and, although every effort was made by district men to impress on planters the importance of thorough selection and disinfection of the seed, much room for improvement remained, and was the cause of great losses and dissatisfaction when the potatoes came on the markets. Every effort will have to be made towards improving this very important crop, not only in respect to disease, but in the selection of seed and improvement of grading and marketing.

Other Insect Pests and Diseases.—Many other insects gave considerable trouble in local sections throughout the Province and were attended to by the fieldmen as far as possible. The following might be mentioned: Cutworms, onion-thrips, cabbage, turnip, and onion maggots, cabbage-worm, green aphis of the apple, and other crops; bud-moth, oyster-shell scale, and red

spider. In fungus diseases: Raspberry anthracnose, strawberry-leaf spot, and mildew; also many other minor insect pests and diseases affecting vegetable and fruit crops.

Summary of Pest Situation and Control.

It has always been a great deal of pleasure to all Government men to be able to state that British Columbia was practically free from all pests. In a degree this might still be said without exceeding the practical truth. With our rigid and careful service of inspection of imports and field-work, this Province is in a class by itself as far as serious pests are concerned. There are certain indigenous pests, or those just as common as the plants on which they live, which no inspection system could guard against, but there are very few pests of a really serious nature at the present time, with perhaps the exception of the codling-moth, which happily is confined to small areas, and these areas are being rapidly reduced by our rigid inspection and spraying measures. It cannot, of course, be expected that this pleasant state of affairs will continue for all time, as pests are bound to gain their entrance sooner or later in spite of every precaution. It will, however, be our serious aim to keep out every pest which might become a dangerous one, and to control or eradicate, as far as possible, those pests which have already gained an entrance.

Demonstration and Experimental Orchards.

The majority of the demonstration and experimental orchards, which were started in 1911 on a five-year agreement, have been turned over to the owners. In the case of some of these orchards the district men have seen fit by mutual agreement to carry on the orchards at no cost to the Government, except for supervision; the owners agreeing to give all information and keep records as desired. The experimental orchards at Nicola, Windermere, Wardner, Waldo, and Rossland have required a number of replacements each year due to varieties not succeeding, and it was felt advisable to keep these on under our supervision until the orchards could be left in at least a fairly complete condition. This will be made possible after the spring of 1918, when all varieties not likely to succeed will be replaced by more suitable hardier sorts, and the orchards will be turned over to the owners in as good a commercial state as possible under existing local conditions.

The results obtained from these demonstration orchards have been as good as could be expected under a five-year agreement. The experimental orchards have at least allowed us a good opportunity to test out different varieties in the different sections and to ascertain what varieties of fruits might succeed in each. The information, although negative in the majority of cases, is very valuable in giving advice to future settlers in these parts.

Central British Columbia Plots and Test Trees.

At Bella Coola, S. LeC. Grant continued to operate the plot this past season, but the severe flood which visited the valley in October destroyed all the crops, so that no report could be made. The plot has been closed down.

A few fruit-trees of varieties likely to succeed were sent out by this Branch to be planted on the different Agricultural Department plots in the central sections of the Province; no report has been received on these.

Strawberry-plot at Hatzic.

Owing to changes in Branch officials and general labour shortage, it was not possible to give this plot the attention it required, and it was considered best to cancel the lease between the Government and Mr. Catherwood, on whose place the plot was located. The size of the plot—namely, ½ acre—was considered too small in order to do justice to the small-fruit possibilities of the district. The discontinuance of this work in the Mission-Hatzic District is to be regretted, and it is hoped that a plot on a much larger scale may be undertaken by the Government, where all small fruits adapted to this district could be grown and possibilities demonstrated from a commercial standpoint.

Southern Okanagan Vegetable and Fruit Station, Summerland.

The work at this station, under J. L. Hilborn, was well executed in 1917, very excellent yields and returns being obtained at the station. It has been very clearly demonstrated that by proper methods tender vegetables can be grown successfully and profitably in this section.

A large and growing market for all tender vegetables is opening up yearly, and the work done by Mr. Hilborn (backed up by his long and successful experience in this line of work in the East) has unquestionably created a wonderful interest in the possibilities of this section of the Province in the production of these crops. The accurate data as to yields, costs, and returns furnished from this station are exceptionally valuable to have at hand, and the work should be continued. Mr. Hilborn's report fully covers the work done at the station.

HORTICULTURAL CROP COMPETITIONS.

There were twenty-seven competitions held in the Province during 1917, as follows:—

Farm garden	12
City garden	8
Strawberry	3
Bearing orchard	2
Raspberry	1
Onion	1
Total	27

The interest and friendly rivalry created by these various competitions in the different sections are very satisfactory, and undoubtedly lead to better crops and increased production. The judging was done by the district men who were in a position to extend any help or information with regard to the crops and the cultural methods practised while doing the scoring. This is a good line of work and should be continued with some modification in the number and size of the prizes awarded.

PUBLICATIONS.

The supply of horticultural circulars and bulletins in the Department is in most cases exhausted, or almost so, and to meet the great demand for this information the Branch is having prepared some fifty-odd circulars 5¾ x 8¾ inches in size, four to eight pages, with two to four illustrations. These will be written by experts on the particular subjects, with the object of supplying up-to-date, concise, practical information suited to our local needs and conditions.

Contributions to the Department's *Agricultural Journal* and other papers have been prepared from time to time on timely subjects.

JUDGING AT FAIRS AND FLOWER-SHOWS.

Practically all the fruit and vegetable judging at the Provincial fairs was done by officials of this Branch. These fairs afford a good opportunity for meeting the growers, discussing their problems and the merits or demerits of their produce, so that the time entailed on this line of work is usually well spent. A report on all fairs judged is submitted to the Department at the end of the fair, and comment, suggestions, or recommendations towards their improvement is made to the Secretary of fairs.

INSTITUTE AND LECTURE WORK.

A good deal of the time of the officials of the Branch is devoted to attending meetings and demonstrations at which are given lectures and talks on various horticultural subjects. The specific information at hand, backed by our demonstration and experimental work in the different districts, is of the greatest value to the growers.

The appreciation expressed by the growers at these institute and other special meetings warrants the extension of this valuable feature of our work.

PRAIRIE MARKETS COMMISSIONER'S OFFICE.

J. A. Grant was appointed in April to fill this position on the resignation of W. E. McTaggart. The Commissioner spent some considerable time in acquainting himself with trade and crop conditions in British Columbia and in Western United States before establishing himself at Calgary, on the Prairies, where his main work was carried on. The way in which Mr. Grant acquainted himself with conditions and became familiar with the markets and their peculiar requirements on the Prairies has met with the most cordial appreciation from growers and the trade. The extension of our markets to the larger centres in Eastern Canada in 1917 was also encouraged, with very promising and gratifying results.

The long, practical fruit experience which Mr. Grant possesses has enabled him to give very valuable information to the growers with respect to the condition of their fruits on arrival on the market, besides useful hints and suggestions given in the Commissioner's weekly bulletin issued from June to November. His work has also included numerous personal visits and letters to growers and shippers. It can well be stated that there has been the heartiest cordiality between the Commissioner and the British Columbia growers and shippers, brokers, jobbers, and retailers of fruits and vegetables on the Prairie and Eastern markets. The knowledge and information gathered by the Commissioner during the year will be of still greater value in years to come, and it is hoped that his valuable services may be retained and his work extended as our markets demand.

The Commissioner's report deals fully with the work.

Coast Markets Commissioner's Office.

This office, at Vancouver, under R. C. Abbott, has been of invaluable assistance to British Columbia growers and shippers on the Coast. Much timely information has been given through the weekly market reports issued by his office from June to December, inclusive, as well as through many personal letters and visits made to growers and shippers in British Columbia.

The export potato trade was given particular attention, and the inspection system on potatoes and export fruits has greatly improved our exports and been heartily received by all concerned. Much good advertising by timely articles in the press, and the distribution of circulars on the canning of fruits and vegetables, the potato and fruit booklets, etc., have informed and greatly helped the growers and consumers of our fruit and vegetables to get together to the very best advantage. In this way the great wastes which often occur in the larger centres have been eliminated to a great extent.

The Commissioner also assisted in the enforcement of the "Eggs Marks Act," with very gratifying results.

The full report of the Markets Commissioner will be seen elsewhere.

Conclusion.

This report would be incomplete without an expression of appreciation of the hearty assistance rendered by the various officials of this Branch and of the careful and capable way in which they have carried on the work during the period your Horticulturist has been in charge. In every instance they have been covering extra territory besides working short-handed, so that the greatest credit is due them for the invaluable work they have rendered under the existing difficulties.

All of which is respectfully submitted.

M. S. Middleton,
Provincial Horticulturist and Inspector of Fruit Pests.

ANNUAL REPORT OF ASSISTANT HORTICULTURIST AND INSPECTOR OF FRUIT PESTS FOR THE NORTHERN OKANAGAN, SHUSWAP LAKE, CANADIAN PACIFIC RAILWAY MAIN LINE SECTION EAST OF LYTTON, AND UPPER COLUMBIA VALLEY DISTRICTS.

P. E. French.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit my annual report on the work in the above districts for the year 1917.

Packing-schools.

A large number of our fruit-packers have responded to the call for overseas service. This, coupled with prospects of an increased crop of fruit, made the packing situation appear rather serious for the 1917 season. On this account your assistant thought that the promoting of packing-schools was an important feature of the work during the early part of the year. The number of pupils who made application for instruction far exceeded expectation, and as a result

of schools held many 1917 pupils were found making good in fruit-packing houses during the past season. About 200 pupils were accommodated in the Vernon-Oyama District alone, a large percentage being girls and women.

PRUNING-SCHOOLS.

The call for pruning-schools was not as great as it has been formerly, on account of the large number of pupils accommodated the past few years and on account of the heavy enlistments from the fruit-growing sections.

Your assistant personally conducted one school for adults and one for high-school boys in the Vernon District.

CROP COMPETITIONS.

Two farm-garden competitions were held during the year, one under the Northern Okanagan Farmers' Institute at Grindrod and Mara, and one under the Nicola Farmers' Institute at Lower Nicola. Your assistant acted as judge of the former and C. R. Barlow of the latter. Great interest was taken by the competitors and keen rivalry shown. Some of the gardens were a credit to any district and showed that great pains had been taken. Scores and reports of these competitions have been submitted.

FARMERS' INSTITUTE AND OTHER MEETINGS.

During March lectures were given on horticultural subjects at Farmers' Institute meetings at Notch Hill, Salmon Arm, and Armstrong, and twice during the year at the Coldstream Fruit-growers' Association. Reports of these meetings have been submitted.

On June 4th your assistant attended the Spallumcheen Farmers' Institute annual picnic at Hullcar, Armstrong.

JUDGING AT EXHIBITIONS.

In September your assistant acted as judge of the fruit and vegetable sections of a Coast circuit of fairs. Separate reports of each fair, with marked prize-lists attached, were submitted at the close of each fair.

EXPERIMENTAL ORCHARDS.

The five-year agreement between the owner of the Windermere Experimental Orchard and the Government terminated last spring. Considerable replanting was necessary in the spring, and all injured trees were replaced by the Department with hardy varieties and the orchard left in good order for the owner. A separate report on this orchard is being forwarded. The other experimental and demonstration orchards have been turned over to the owners.

CROP STATISTICS.

At various seasons of the year estimates of crop yields and conditions were reported on, and at the end of the season statistics are forwarded regarding the total production of fruit and vegetables, the total amount of the manufactured products, etc. As this district has been considerably increased in area, the amount of time entailed in collecting these statistics has also increased.

SURVEY-WORK.

In the winter months during weather which is not favourable for field-work, the local Inspectors have been filing and working out data from the orchard and truck-crop statistics collected in 1916. Considerable useful information can be obtained from these survey reports.

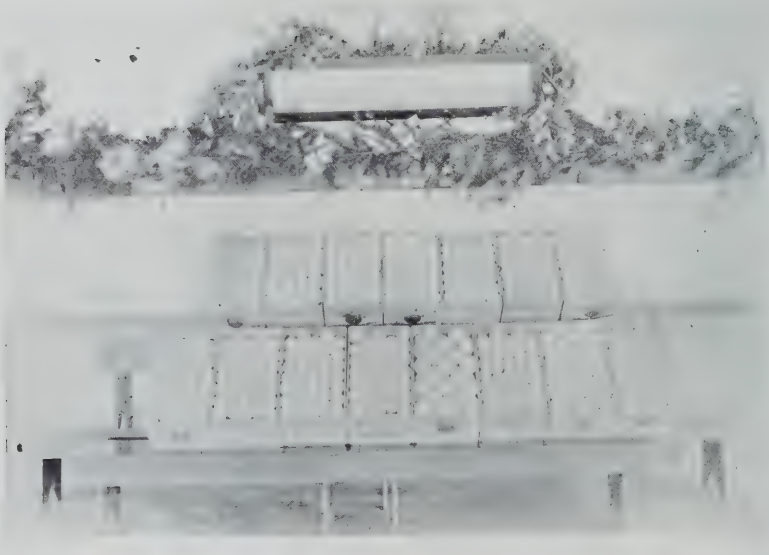
EXPERIMENTAL WORK.

Experimental work was again undertaken along much the same lines as last year. This included principally spraying experiments for the control of apple-scab and aphides with different spray mixtures and strengths of lime-sulphur. The experiments which were carried on in 1916 were duplicated this past season; the locality tests being conducted at Vernon and Salmon Arm and the material test at Salmon Arm.

Different strengths of lime-sulphur were tested at Vernon for the control of apple-scab, and different spray materials were tested for the control of aphides.

British Columbia apples are superior in quality.

Fruit-packing school, 1917.



Fruit packed by packing-school class at Vernon, 1917.

The following is a summary of these experiments:—

(A.) *Locality Experiment.*—Conducted on the same plots as in 1916, both at Salmon Arm and Vernon. Variety, McIntosh Red. Trees eleven and thirteen years old, former at Salmon Arm.

Time of Spray.	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.	Plot 7.
Delayed dormant	L.S. 1-25	L.S. 1-25	...	...	...	...	Check.
Pink	L.S. 1-30	...	L.S. 1-30	L.S. 1-30	L.S. 1-30	L.S. 1-30	„
Calyx	L.S. 1-35	L.S. 1-35	L.S. 1-35	L.S. 1-35	L.S. 1-35	L.S. 1-35	„
10-14 days later	L.S. 1-35	L.S. 1-35	L.S. 1-35	L.S. 1-35	...	...	„
10-14 days later	L.S. 1-35	L.S. 1-35	L.S. 1-35	...	...	L.S. 1-35	„

Arsenate of lead, 2 lb. to 40 gallons, was added for the calyx spray on all plots.

In making the final count, all the apples on certain uniform trees in each plot were carefully examined and notes taken on the scab.

Result of Locality Experiment at Salmon Arm (Average for Two Years).

Plot.	Fruit free from Scab.	Scabbed but Marketable.	Total Marketable.	Culls on Account of Scab.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	99.03	0.97	100.0	None.
2	97.23	1.95	99.18	0.82
3	95.33	4.04	99.37	0.63
4	82.93	16.25	99.18	0.82
5	43.63	47.37	91.0	9.0
6	92.5	7.05	99.55	0.45
7	0.75	29.85	30.6	69.40

From these results it can easily be seen that Salmon Arm fruit can be produced free from scab, even those varieties which are very susceptible to the disease. In 1916 three sprayings, as per Plot No. 6, gave the most economical results, but in 1917 the three sprayings, pink, calyx, and four weeks later, gave the best results for the money expended.

Result of Locality Experiment at Vernon.—At Vernon, Plot No. 8 was added the past season, and on this only two sprays were applied—the calyx and one two weeks later—both with lime-sulphur 1-35. The following results are the averages for the two years except in the case of Plot No. 8:—

Plot.	Fruit free from Scab.	Scabbed but Marketable.	Total Marketable.	Culls on Account of Scab.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	99.89	0.11	100.0	None.
2	99.78	0.11	99.89	0.11
3	99.59	0.26	99.85	0.15
4	99.38	0.42	99.80	0.20
5	96.90	1.04	97.94	2.06
6	98.90	0.86	99.76	0.24
7	67.05	15.77	82.82	17.18
8	99.20	0.45	99.65	0.35

According to these results, apples in the Vernon District can be produced commercially free from scab by the application of two sprays, the calyx spray and one in two to four weeks later, depending on the weather conditions. From results obtained it is quite evident that the calyx spray is the most important.

(*B.*) *Materials Test.*—Lime-sulphur; atomic sulphur; Bordeaux mixture. This test was conducted on McIntosh apples at Salmon Arm on the same trees as in 1916.

Spraying.	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.
Pink	L.S. 1-30	A.S. 6-40	L.S. 1-30	L.S. 1-30	B.M. 4-4-40	Check.
Calyx	L.S. 1-35	A.S. 6-40	A.S. 6-40	L.S. 1-35	B.M. 4-4-40	„
3-4 weeks later	L.S. 1-35	A.S. 5-40	A.S. 5-40	A.S. 5-40	B.M. 4-4-40	„

L.S.—Lime-sulphur. A.S.—Atomic sulphur. B.M.—Bordeaux mixture.

Arsenate of lead, 2 lb. per 40 gallons of the spray mixture, was added to all calyx sprays in this test.

Result (Average of Two Years, 1916 and 1917).

Plot.	Fruit free from Scab.	Scabbed but Marketable.	Total Marketable.	Culls on Account of Scab.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	89.13	9.5	98.63	1.37
2	46.20	37.64	83.84	16.16
3	54.35	35.07	89.42	10.58
4	81.74	16.80	98.54	1.46
5	83.95	13.40	97.35	2.65
6	0.75	29.85	30.60	69.40

Plot No. 5, which was sprayed with Bordeaux mixture, had 40 per cent. of the fruit russeted on account of burning. This russeting lowered the grade of this amount to No. 2 and No. 3 apples.

From the above results it will be noticed that the lime-sulphur spray gave the best results right through the experiment.

A field-day was held to show the growers over these plots, and great interest was taken by them in the results obtained.

There was practically no difference in the amount of fruit taken from the lime-sulphur and Bordeaux-mixture plots. The atomic-sulphur plot yielded about 80 per cent. of the amount taken from each of the other two plots. This decrease was undoubtedly due to the damage done by scab and not to the set of fruit.

(*C.*) *Experiment to test Different Strengths of Lime-sulphur in the Control of Apple-scab.*—Conducted at Vernon on McIntosh apple-trees thirteen years old.

Spray.	Plot 1.	Plot 2.	Plot 3.	Plot 4.
Pink	L.S. 1-30	L.S. 1-35	L.S. 1-40	L.S. 1-40
Calyx	L.S. 1-35	L.S. 1-40	L.S. 1-45	L.S. 1-50
10-14 days later	L.S. 1-35	L.S. 1-45	L.S. 1-45	L.S. 1-50

Result.

Plot.	Fruit free from Scab.	Scabbed but Marketable.	Total Marketable.	Culls on Account of Scab.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	99.88	0.04	99.92	0.08
2	99.55	0.28	99.83	0.17
3	99.56	0.30	99.86	0.14
4	99.36	0.34	99.70	0.30

In this case the weaker strengths of lime-sulphur have given practically the same results as the stronger ones which have been usually applied. It is hoped that this experiment will be carried on again in 1918, because results show that a great saving can be effected in the cost of the spraying.

A separate report will be forwarded on the experimental work in regard to the control of aphides. The results should be carried on another year before being published.

Pest-inspection Work.

On March 31st R. J. Kyte resigned the position of local Inspector for the Vernon-Armstrong District, and on April 9th H. H. Evans was appointed as his successor. C. R. Barlow has again acted as Inspector for Salmon Arm District and Canadian Pacific Railway main-line points. The very satisfactory manner in which these gentlemen performed their duties is hereby acknowledged.

Inspection of Export Fruit and Vegetables.

During the shipping season all export fruit and vegetables were inspected and certificates issued. This required constant attention, although the shipments were not as heavy as usual, due principally to the embargo put on by Great Britain and Australia. Generally speaking, the quality was very good and the fruit free from disease. In a few cases portions of the car had to be condemned on account of apple-scab, lesser apple-worm, or water-core.

Inspection of Empty Cars.

To guard against the possibility of codling-moth infection, empty railway-cars were again inspected the past season. The Canadian Pacific Railway had all foreign cars collected at Okanagan Landing for icing and inspection purposes.

The greatest danger from infection from codling-moth is undoubtedly from foreign cars which come up from codling-moth-infested areas in Washington, Oregon, and other States. In one car no fewer than fourteen healthy full-grown codling-moth larvæ were discovered in the cracks. In four others live larvæ or pupæ were found.

On arrival at Okanagan Landing all foreign cars were immediately inspected, all rubbish cleaned out and burned, and the car iced several hours before being forwarded to Vernon for loading. Where a car was found to be infested it was immediately iced, ventilators and doors closed, and the car sent out either empty or loaded with fruit right at the landing for shipment to the Prairies.

Eighty-seven foreign cars and a large number of Canadian Pacific Railway cars were inspected in this way during the season.

The Canadian Pacific Railway agent at Okanagan Landing and the freight agent at Vernon assisted in every way possible to get the inspection-work and icing done promptly.

Inspection of Nurseries.

The various nurseries in this district were inspected several times during the growing season and the trees examined carefully at digging-time. A percentage of the stock was condemned for crown-gall, hairy root, or winter injury, these being the three main troubles. Separate reports on each nursery have been submitted.

Field-work.

The staff of Inspectors is hardly adequate to make as thorough systematic inspections as might be desired under normal conditions. However, under the present war conditions every one realizes that it is only the most necessary work that is to be carried on. This has been the case in the work in this district, and expenses have been kept down as low as possible consistent with efficiency.

Aphides.—Green aphides have not been very troublesome during the past season. Woolly aphides, however, are certainly getting a strong foothold in some parts of the valley, and growers should see to it that more thorough control measures are practised.

Apple-scab.—This disease has not caused as much damage to fruit in the past season as in 1916. This is partly due to the season and partly to the more efficient methods of control practised by the growers.

Oyster-shell Scale.—This insect is not a very serious pest in the well-managed orchards. It is noticed mainly in the neglected and old orchards.

Fire-blight.—This disease is scattered here and there throughout the Vernon and Armstrong Districts. In a few cases the disease is well established, but, generally speaking, it is mostly scattered on odd limbs on such varieties as the Spitzenberg. The extreme shortage of labour has made it very hard for the average grower to keep the blight under control. Mr. Evans has the various infections fairly well located, and it is the aim of your assistant to clean this up during the present dormant season.

The Oyama growers have the blight well under control in that district.

In the Shuswap Lake districts a few infections occurred throughout the season, but Mr. Barlow has these well under control. An inspection will be made for any hold-over cankers during the dormant season.

San Jose Scale.—The orchards at Spences Bridge, where a bad infection of this pest had occurred, have been cleaned up, and no San Jose scale was found during the past season on the fruit-trees or fruit. New infections were, however, found on some wild growth of choke-cherry, willow, and maple, and these are being attended to.

Codling-moth.—The codling-moth quarantine area at Okanagan Landing required very close attention again the past season, and I am pleased to report the satisfactory progress which was made. The worms were reduced to about 10 per cent. of the number captured in 1916, and the infested area was cut in half. The fruit was very small in this infested area on account of the dry season and lack of irrigation. This caused more work in the inspection and eradication methods employed than there otherwise would have been. Eight band inspections were made. All the quarantined area was sprayed thoroughly twice, and the portion where codling-moths were showing up this season was sprayed three times. The rough bark was scraped off the trees, all wormy fruit and culls were destroyed by boiling, and the good fruit, after close inspection, was shipped to the Prairie Provinces.

About 65 acres of orchards were put under quarantine at Walhachin on account of the codling-moth discovered there in the fall of 1916. Methods of eradication employed here were similar to those practised at Okanagan Landing. Very thorough work was done by Mr. Buckell, who was in charge of this work at Walhachin for the season, and I feel sure that the results of work done will be shown by the very small emergence of the pest next season. The growers at Walhachin co-operated with the Department in every way possible to eradicate the pest.

No evidence of codling-moth was discovered in the Kamloops District during 1917. Mr. Barlow has had instructions to keep a close watch on this district for any recurrence of this insect.

GENERAL.

Many calls have come in for general orchard visits and demonstrations, and considerable time is taken up with this line of work, which is always popular.

The volume of office-work has steadily increased and necessarily had to be attended to. This was especially true since the inspection-work was turned over to the Horticultural Branch.

All of which is respectfully submitted.

P. E. FRENCH,
Assistant Horticulturist and Inspector of Fruit Pests.

ANNUAL REPORT OF ASSISTANT HORTICULTURIST, SOUTH OKANAGAN AND SIMILKAMEEN DISTRICTS.

B. Hoy.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

Sir,—I herewith submit my annual report as Assistant Horticulturist for the South Okanagan and Similkameen for the year 1917.

Meetings and Fall Fairs.

Lectures on horticultural subjects were given at the following meetings: Glenmore (two), Ellison, Rutland, Benvoulin, Westbank (two), and Peachland.

Fall fairs were attended in the capacity of judge of fruit and vegetables at Nanaimo, Lasqueti Island, Denman Island, Duncan, Saltspring Island, Central Park, Ladysmith, Parksville, Courtenay, Alberni, Summerland, and the Home Products Exhibition, Victoria. A report on this work has been submitted.

Pruning-schools.

Pruning-schools were organized and instruction given at Westbank, Naramata, and Kelowna.

Short Course in Agriculture.

A two weeks' short course in agriculture was organized and held at Summerland. The horticultural lectures were given by your assistant and the Horticulturist for the Kootenay District.

Experimental Work.

Experimental spraying was conducted this year on apple-scab and woolly aphis at Kelowna, and peach-mildew, leaf-curl, and twig-borer at Summerland.

At Kelowna work was done in the control of grasshoppers, also in the control of wireworms and cutworms in onions.

Apple-scab.—In these experiments the following sprays gave 95 per cent. clean fruit: Lime-sulphur 1-30 when the blossom-buds were pink; lime-sulphur 1-35 when the petals had just fallen and 1-35 two weeks later. On the unsprayed plot there was 70 per cent. clean fruit.

Following are the results of apple-scab experiments at Kelowna, 1917, showing the benefits of certain sprays (lime-sulphur used in all sprays):—

Plot 1: Unsprayed; 30 per cent. scab.

Plot 2: Sprayed once, May 10th; 20 per cent. scab.

Plot 3: Sprayed twice, May 10th, 1-30, and May 30th, 1-40; 5 per cent. scab.

Plot 4: Sprayed three times, May 10th, 1-30; May 30th, 1-40; and June 12th, 1-35; 5 per cent. scab.

Plot 5: Sprayed five times, May 10th, 1-30; May 17th, 1-30; May 30th, 1-40; June 12th, 1-35; and June 25th, 1-40. Practically free, about same as where sprayed four times.

Plot 6: Same as above, only sprayed six times, the first spray being put on May 2nd. Results same as where only sprayed four times.

Main orchard: This was sprayed the same as Plot No. 4 and again on June 25th, and was commercially free of scab. From the above results it would seem that the pink, calyx, and one later spray thoroughly applied would control scab in any normal season.

Woolly Aphis.—In these experiments several sprays were tried, but the regular formula of Black Leaf 40 and soap gave as satisfactory results as any. In this experiment it was found that thoroughness of the work was the chief factor, and that even then only a small percentage of the aphides were killed with one spray. High pressure and thoroughness are very essential in controlling this pest.

Peach-mildew and Leaf-curl.—Owing to the climatic conditions these diseases did not become prevalent enough to show any difference between the check-plots and the sprayed plots.

Peach-twig Borer.—In this experiment arsenate of lead and lime-sulphur were used. The best results were obtained with lime-sulphur 1-9 when the buds were swelling. On the trees sprayed there was 92.4 per cent. clean fruit and on the unsprayed plots only 49 per cent. A detailed report of this work has been submitted.

Grasshoppers and Wireworms.—A detailed report of these experiments has been submitted to the Department. The so-called Kansas mixture gave excellent results in grasshopper-control, and the mixture, 10 lb. of rice, bran, and one cup molasses, with enough water to make into a dough, made a splendid trap for catching wireworms. Small balls of this mixture were buried about 3 inches deep at intervals of 10 or 12 feet in the infected soil of the field. These were marked and the balls taken up and worms removed every three or four days during the early part of the season. T. W. S. Taylor gathered over 50,000 worms from less than one acre in one day by this method.

Crop Competitions.

A competition in onion-growing was held in the Kelowna District. There were fifteen competitors, and in nearly all cases much interest was shown. These plots were judged by your assistant three times during the season.

Orchard-survey Work.

The 1916 and 1917 orchard-survey reports are being compiled, and this survey is being followed by another at the present time to get new plantings and an accurate record of the condition of each orchard.

Besides this, a special peach and apricot survey is being made for the purpose of outlining a plan of control for the peach-twig borer, which is becoming more prevalent each year and a menace to the peach and apricot industry.

Codling-moth Control.

In 1917 this work at Kelowna was dropped and no new outbreaks were found. At Westbank the work was carried on similar to last year, with the exception that a third spray was applied and the bands were inspected seven times instead of five. In all, forty-eight worms were found and ten punctured apples. This year there was an increase of 6,000 boxes of apples, making a total of 18,000 and a decrease of over 80 per cent. in the number of worms found as compared with 1916.

Fire-blight Inspection.

This work is being carried on as in previous years. In the early spring of 1917 there was considerable blossom-blight, but only a few cases of severe infection. Owing to the great shortage in labour it is becoming more difficult each year to get efficient men to do the cutting-out of this disease.

Inspection of Fruit.

Apples for export were inspected at Kelowna and certificates issued to the shippers throughout the district. Besides the export shipments, a great deal of fruit was inspected for growers at their request during the shipping season. All packing-houses were visited from time to time throughout the year in order to locate any new diseases or insects that might find their way into the district.

Vegetable Inspection.

No potatoes for export left this district this year, but several cars of onions, potatoes, carrots, etc., were inspected in order to advise on the condition of produce for shipping.

General Work of Branch.

Work along the same lines as in previous years was conducted this year. Many requests came in from growers in various parts of the district, who wished advice on certain operations, and a great many visits were made to various places for this purpose. Office duties have been increasing each year, and much time is taken up answering inquiries and interviewing growers in the office.

Respectfully submitted.

B. Hoy,
Assistant Horticulturist.

ANNUAL REPORT OF ASSISTANT HORTICULTURIST AND INSPECTOR OF FRUIT PESTS, VANCOUVER ISLAND AND LOWER MAINLAND DISTRICTS.

E. W. White.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit herewith my annual report as Assistant Horticulturist and Inspector of Fruit Pests for Vancouver Island and the Lower Mainland for the year 1917.

Change in Position.

From January 1st to June 2nd, your assistant occupied the position of District Fruit Pest Inspector for Vancouver Island and the Gulf Islands, being attached to the temporary staff. On June 2nd H. Thornber, Assistant Horticulturist and Inspector of Fruit Pests for the Kamloops District, with headquarters in Victoria, and acting in the same capacity for the Lower Mainland and Vancouver Island, in place of W. H. Robertson, on active service, resigned his position with the Department to accept a more lucrative position in Montana.

Following instructions from R. M. Winslow, then Provincial Horticulturist and Inspector of Fruit Pests, your assistant on June 4th assumed the duties relinquished by Mr. Thornber and was gazetted to the permanent staff as Assistant Horticulturist as from June 1st.

Continuation of the Pear-thrips Work in Saanich.

The pear-thrips work which was begun in 1916, and on which a full report has been given, was continued during 1917 on practically the same basis, but with a few minor changes.

R. C. Treherne and Dr. A. E. Cameron, Field Officers for the Dominion Entomological Branch in British Columbia, again had charge of the investigational and life-history work, while your assistant was again detailed to take charge of the spraying operations for the Provincial Department. The major portion of the months of March, April, May, and June were occupied on this work.

As in 1916, this Department again supplied the three power-sprayers free of charge to the growers in the districts where the investigations were being carried on, and under the same agreement, with the exception that no paid engineer was put in charge of each machine.

Machine No. 1 remained in the orchard of T. A. Brydon & Son, Royal Oak, and was operated by J. M. Brydon.

Machine No. 2 was again operated in the orchards of Stewart Bros., Tanner Bros., J. H. Sutton, and A. E. Gale, and was in personal charge of the writer during the season.

Machine No. 3, located in the Gordon Head section, was not operated by the Department owing to the slightness of the pear-thrips infection in that district, but permission was given to a number of growers to use the machine in their own interests, on the understanding that it be returned in the same condition in which it was received. A. E. Cameron, of Gordon Head, had supervision over the machine.

No special attempt was made to sell spray material at the different centres in 1917, but the material held over from last year was disposed of to the growers who applied for it.

Three general spray applications were again made this year, as follows: The first, just as the buds were bursting in the spring, which is coincident with the emergence of the thrips; the second, just as the blossom-clusters were showing pink, which corresponds to the maximum egg-laying period; and the third, just as the blossoms were falling, to control the larvæ.

Owing to the prevalence of apple-scab in the orchards sprayed for thrips in 1916, the formulæ were changed somewhat this year in an endeavour to control the scab. In 1916 the main object was to control the thrips, and the results were very satisfactory as far as they were concerned. This year an endeavour was made to control the scab as well as the thrips, and efforts were successful.

In 1917 the formula used for the first spraying was the same as in 1916, being the remedy recommended by the New York authorities, and was as follows (United States measurements): Nicotine sulphate (Black Leaf 40), 1½ pints; whale-oil soap, 10 lb.; water, 200 gallons.

Miscible Oil No. 2, prepared by the Balfour-Guthrie Company, of San Francisco, which has been used extensively in California on pear-thrips work, was again used experimentally in 1917 for the first spraying in the following proportion (United States measurements): Miscible Oil No. 2, 5 gallons; nicotine sulphate (Black Leaf 40), 1 pint; water, 200 gallons.

This spray was used almost exclusively for the first application on pears, on which satisfactory results were not secured in 1916. The oil mixture is much more penetrating than the soap preparation, and the results were very promising, but the control of the thrips on pears will need further consideration in 1918.

For the second and third general sprayings in 1917 the following formula was used instead of the soap mixture used the previous year (United States measurements): Nicotine sulphate (Black Leaf 40), 1½ pints; lime-sulphur solution, 4 gallons; arsenate of lead, 8 lb.; water, 200 gallons.

It will be seen that in an endeavour to control the scab the spreading properties of the soap was sacrificed—so essential in the control of thrips—for the fungicidal value of lime-sulphur, which is equally valuable in the control of scab.

The general results were that, while the lime-sulphur did not have the same killing effect on the thrips, still they were held in check, and at the same time scab was controlled to a large extent. Arsenate of lead was added for the control of any leaf- or fruit-eating insect.

While the spring of 1916 was considered exceptionally backward, the season of 1917 was even worse in that respect. A comparison of the main spraying dates for the two years may be noted in the following:—

Pear-thrips Spraying.	1916.	1917.
First application, buds bursting	March 29 to April 8	April 9 to April 24.
Second application, blossoms pink	April 27 to May 3	May 4 to May 17.
Third application, blossoms falling	May 22 to May 29	June 4 to June 12.

A factor entering into the control of the pear-thrips was discovered during the present season, when it was found that, besides being a pest of deciduous fruit-trees, it had become thoroughly established on many other trees and shrubs on Vancouver Island, principal among which are the broad-leaved maple (*Acer macrophyllum*), June-berry (*Amelanchier florida*), willow (*Salix scouleriana*), red-flowering currant (*Ribes sanguineum*), choke-cherry (*Prunus demissa*), Nuttall's cherry (*Nuttalia cerasiformus*), and also incidentally on skunk-cabbage (*Lysichiton kamschetkense*), Douglas fir (*Pscudotsuga mucronata*), Oregon grape (*Berberis nervosa*), daisy (*Bellis perennis*), and dandelion (*Taraxacum officinale*). It was also found to occur on ornamental shrubs, such as *Andromeda floribunda*, *Viburnum opulenta*, and Japanese flowering plum.

In some cases in 1917 the injury caused to maples was even greater than that done to deciduous fruit-trees. In one case at Duncan twenty buds of a maple, on examination, yielded approximately 1,000 thrips.

It has been demonstrated that the species can successfully complete its life-history on the broad-leaved maple, the June-berry, choke-cherry, and Nuttall's cherry, causing damage exactly parallel to that which it commits on deciduous fruit-trees.

On an inspection tour conducted by Dr. A. E. Cameron and your assistant, the pear-thrips were found to exist as far north as Nanaimo and on some of the islands of the Gulf. R. C. Treherne, who made a thorough examination of the orchards of the Lower Mainland, failed to find the species located in that district.

After two years' investigation the life-history has been thoroughly worked out and the efficiency of the various control measures demonstrated. At the present time a bulletin is being prepared by Messrs. Treherne and Cameron on the pear-thrips, and it is hoped it will be available for distribution by March, 1918, so that the fruit-growers will have it as a reference for their spring campaign.

INSPECTION OF POTATOES FOR EXPORT.

During January, February, and March considerable time was occupied in the inspection of potatoes for export.

This export trade resulted from the shortage of the 1916 crop in the United States and the high prices offered local dealers for their stocks. Out of a large number of cars inspected only three passed for export. This small percentage was due to the fact that a number of the cars offered here for export were cars which had already been turned down by the Inspectors on the Lower Mainland earlier in the season. Another factor against export was due to the fact that none of the local stocks had been inspected in the field before being sent to the trade, and they were not selected with the idea of being exported.

During October several cars of Ashcroft potatoes were inspected, which had arrived in Victoria in very poor condition for that season of the year. These potatoes were intended for winter storage, but it was found necessary to sort them all over and to dispose of them as soon as possible.

Pruning-schools.

During the latter part of February and the first week of March two pruning-schools were conducted, one each at Rocky Point and Metchosin. The attendance was well up to the average and a great deal of interest was shown. There are a number of young orchards in these districts which need attention. The weather was very unfavourable.

Hatzic Experimental Strawberry-plot.

This plot was operated under rather unfavourable conditions in 1917; Mr. Thornber, who had charge of the work, having resigned just at the beginning of the strawberry season.

It was found very difficult to secure suitable help during the shipping season owing to the great labour shortage; also owing to the rush of other work personal attention could not be given. However, the crop was harvested, records kept, and disposition effected to the best advantage.

As the lease for this plot expired at the end of the 1917 season and it was not possible to secure the results desired, it was decided to discontinue the plot.

Horticultural Competitions.

During the summer your assistant was called upon to judge at all of the competitions held in his district; in fact, a greater portion of the time during July and August was spent on this work.

Keen interest was taken in all the competitions, especially those which were held for the first time in 1917. These competitions do a great deal to stimulate interest and better care in the lines in which they are held.

At this time when "Increased Production" is the slogan, the city-garden competitions, arranged with that idea in mind, were especially interesting. In Victoria four different competitions were held, in which ten prizes ranging from $10 to $1 were awarded in each. Although the Department only made the one $35 grant for the four competitions, this was added to by J. H. Todd, of Victoria, by the very generous gift of $200.

The following is a list of the competitions judged and the number of entries in each:—

Place.	Competition.	No. of Entries.
Victoria	City garden, No. 1	33
Victoria	Vacant lot, 3,000 to 6,000 square feet, No. 3	26
Victoria	Vacant lot, 6,000 to 20,000 square feet, No. 4	8
Victoria	Boys and girls under seventeen years, No. 5	12
Ward 2, Saanich	Cottage garden	23
North Vancouver	City garden	17
Metchosin	Farm garden	18
Sooke	Farm garden	10
Gordon Head	Strawberry	7
Keating	Strawberry	9
Hammond	Strawberry	7
Hammond	Raspberry	7

Fall Fairs.

The following fall fairs were attended by your assistant, in the capacity of judge of fruit and vegetables, at the following places: North Vancouver, Cranbrook, Fruitvale, Trail, Nelson, Rossland, Grand Forks, Cobble Hill, and North and South Saanich.

At North Vancouver, Nelson, and Rossland assistance was rendered to Professor F. M. Clement, of the University of British Columbia, who had charge of the judging, and at Cobble Hill and North and South Saanich the same assistance was rendered to the Provincial Horticulturist.

On the whole, the number of entries were much fewer than in previous years. This falling-off is due to two main facts, which apply generally to all the fairs concerned: First, the absence at the front of so many producers and former exhibitors; and, secondly, the great shortage and high price of labour, which made it almost impossible for the men and women who were left on the farms to take the time to prepare a creditable exhibit.

In general, the management of the fairs have been just carrying on and doing the very best they could while the war lasts, but as soon as normal times return they expect to be able to bring their fairs back to the former standard of excellence to which they had attained.

Experimental Fall Spraying with Bordeaux Mixture.

This work, which was begun in 1916 in conjunction with J. W. Eastham, Plant Pathologist, to determine the efficiency of Bordeaux mixture (3-4-40) spray in September while the fruit was still on the trees, to control anthracnose, was continued in 1917. Very satisfactory results were obtained, as shown by the counts made in the spring of 1917. A full report on this work will be submitted by Mr. Eastham.

Inspection of Nurseries.

Owing to the shortage of help in the Department and the rush of other work, it was found impossible to make a thorough summer inspection of the nurseries. A complete inspection was, however, made in the fall at digging-time.

The following nurseries in the Lower Mainland District were visited and inspected: British Columbia Nurseries Co., Ltd., Sardis; Fraser Valley Nurseries, Aldergrove; J. H. Dean, "Roseland Nursery," Aldergrove; Charles H. Provan, Langley Fort; David Spencer, Ltd., Hastings Street, Vancouver; Dominion Nursery Co., 2184 Fourth Avenue West, Vancouver; Gladstone Nurseries, Gladstone; T. Topham, 946 Fifteenth Avenue East, Vancouver; R. J. Taylor, 2456 Main Street, Vancouver; Keeler's Nursery, 145 Fifteenth Avenue East, Vancouver; R. T. Copley, Nanaimo Road, corner Fifteenth Avenue, Vancouver; A. R. McDougall, 524 Kingsway, Vancouver; Nonus H. Abray, Thirty-fourth Avenue and Prince Edward Street, South Vancouver; Foster & Buzzard, Eburne; R. D. Rorison, Royal Nurseries, 207 Hastings Street West, Vancouver; Royal Nurseries, Bridgeport; Brown Bros. & Co., Ltd., 48 Hastings Street East, Vancouver; Garden City Nursery, Lulu Island, Eburne; Granville Nurseries, P.O. Box 343, Kerrisdale; West End Nurseries, 732 Granville Street, Vancouver; Great West Nurseries, Seventeenth Street and St. Andrews, North Vancouver; J. G. Speller & Co., 2000 Larsen Road, North Vancouver; North Vancouver Nursery, Seventeenth Street East, North Vancouver; William Livingstone, Twelfth and Lonsdale, North Vancouver.

The Vancouver Island nurseries visited and inspected were as follows: A. Ohlson, Oakland Nursery, 1580 Hillside Avenue, Victoria; G. A. Knight, Mount Tolmie Nursery, Mount Tolmie P.O.; Quadra Greenhouses, North Quadra Street, Victoria; R. Layritz, Layritz Nurseries, Colquitz P.O., Victoria; Brown's Victoria Nurseries, Esquimalt Road, Victoria; John Barron, Glanford Avenue Nurseries, Victoria.

The nursery business has been more or less stagnant for the past few years, and the stocks at the various nurseries have become very low. However, there are indications at the present time that there will be quite a revival of planting in 1918.

The Layritz Nurseries and the British Columbia Nurseries Company, Limited, are the only firms which have been propagating any considerable amount of new stock. The latter firm dug their own stock from their nursery at Sardis for the first time this year; the stock was in excellent condition. A full report has been submitted on the Nurseries.

Insect Pests and Diseases.

The black-currant bud-mite infection in the Duncan District was again very carefully handled by R. Glendenning, of Duncan, who had charge of the work in 1916. The amount of infection was very greatly reduced over the previous year. Mr. Glendenning has submitted a full report.

The strawberry-root weevil again caused considerable damage in the Gordon Head, Keating, and Lower Mainland Districts, but growers are adopting the remedies recommended by the Department and feel confident in their ability to check its ravages.

The codling-moth on Vancouver Island was of necessity left to itself in 1917, as it was impossible to do any work on it owing to the pressure of other duties. It is the opinion of your assistant, however, that this pest has reached almost a negligible stage.

Cutworms were a very serious menance to growers of garden-truck and field crops, and caused a great deal of damage while they were active.

Other common insects were of about the same severity as usual and did not cause undue damage.

Late blight of potatoes was very serious in the Chilliwack and Agassiz Districts in the fall of the year. Growers will of necessity have to adopt stringent control measures in the very near future or go out of the potato business. One 14-ton pit in the Chilliwack District, opened up just three weeks after the potatoes were dug, showed over 50 per cent. shrinkage from blight.

Apple-scab was not as severe as usual, and there was a considerable quantity of clean fruit. Where proper remedial measures were adopted the percentage of clean fruit was high.

Other diseases did about the same damage as usual, but there is an increasing amount of potato-diseases which need careful attention in the future.

Demonstrations and General Work.

A large number of demonstrations in the various branches of horticultural science were given in all parts of the district during the year, and many personal calls were given to persons inquiring for information. This line of work takes up an increasing amount of time and is much appreciated by growers.

Crop Reports.

Considerable time was spent each month during the summer and fall in gathering crop statistics for Mr. A. B. Tweddle, Statistician. However, no detailed survey-work was undertaken.

Fruit and Vegetable Production.

Climatic conditions were not as favourable as they might have been. A very late spring was followed by an exceedingly dry summer. The fall of the year was exceptionally open, and the apple and pear crop was gathered in excellent condition and much fall work on the land was possible.

On Vancouver Island the strawberry-crop was small, as a late season always means a short crop. It is customary to have the first strawberries on the market on May 24th, but in 1917 it was June 21st before they were offered for sale. The exceedingly hot, dry weather prevalent the first part of July dried this crop up very fast, and, whereas the season usually extends for a period of six weeks, in 1917 it was limited to slightly over three.

The one redeeming feature was the fact that the price was good, and the Gordon Head and Keating Fruit-growers' Associations jointly shipped twenty-two cars, amounting approximately to 17,600 crates, to the Prairies, besides disposing of approximately 150 tons of jam-berries.

The tree-fruit crop was an average one and good prices prevailed in the early part of the season. Olivet-cherry growers received an exceptionally good price for their crop this year.

Potatoes showed a very marked increase in acreage, amounting to almost 25 per cent., but the very late spring and dry summer mitigated against a big crop, and the average yield per acre fell considerably below 1916, making the total tonnage about the same as in 1916.

Vegetable-crops varied greatly, but had a tendency to run light. Fall crops did well.

On the Lower Mainland the raspberry-growers were favoured with much better climatic conditions than in 1916 and were able to ship a great proportion of their crop. The price realized on the Prairie markets was very satisfactory. The canneries took care of a good proportion of the crop at very reasonable prices.

Tree-fruits in this district were not a heavy crop, and the late season and wet weather at blossoming-time seem to have had a very detrimental effect on pollonization. The absence of bees at that period was also very noticeable.

The potato-crop varied greatly, but on the whole it was an average one. Some yields were exceptionally heavy, while others were exactly the reverse. In the Chilliwack District late blight was very severe at digging-time and caused a great deal of shrinkage in marketable stock.

Other vegetable and truck crops were average on the low lands, but suffered from drought on the benches.

OFFICE WORK AND CORRESPONDENCE.

It was necessary to spend an increasing amount of time in the office owing to Mr. Thornber's resignation, and the correspondence assumed increased very considerably.

All of which is respectfully submitted.

E. W. WHITE,
Assistant Horticulturist and Inspector of Fruit Pests.

ANNUAL REPORT OF ASSISTANT HORTICULTURIST, KOOTENAY AND BOUNDARY DISTRICTS.

E. C. HUNT.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my annual report on the work carried on in the Kootenay and Boundary Districts for the year 1917.

The work of the Horticultural Branch in this district included the conducting of packing and pruning schools, horticultural competitions, spraying experiments, supervising the demonstration and experimental orchards, judging fairs, general inspection-work, and personal visits to orchards.

PACKING AND PRUNING SCHOOLS.

During the early part of the year seven packing-schools and one pruning-school were held in this district. The packing-schools were held at the following places: Three at Grand Forks, three at Creston, and one at Passmore. Four of these schools—two at Grand Forks and two at Creston—were held for the boys and girls attending the public and high schools. The only pruning-school held was at New Denver. As a whole, the schools were well attended and a good deal of interest shown by the pupils taking part. A full report of each school was sent in to the Department at the time the schools were held.

HORTICULTURAL COMPETITIONS.

In 1917 there were held in this district by the Department twelve horticultural competitions of various kinds, at the following places: Three city-garden competitions, one at Natal and two at Nelson; seven farm-garden competitions, one each at Robson, Needles, Baynes Lake, Crawford Bay, Willow Point, Wynndel, and Harrop; and two bearing-orchard competitions, one each at Grand Forks and Willow Point. These competitions were judged from two to three times during the season. The details of the scores in connection with these have been submitted. A very keen and friendly rivalry has been created by this work among the farmers where these competitions have been held. The results have been that greater areas have been cultivated and made to produce good crops by careful tillage and management of the soil.

SPRAYING EXPERIMENTS.

Spraying experiments and demonstration-work for the control of apple-scab in this district were started in 1916 at Nelson and Creston, while in 1917 a similar experiment was started at Mr. Forslund's, on the Arrow Lakes. Each of these experiments are to be carried on for at least three years on the same plots, using the same material (lime-sulphur) each year. The results obtained this year were on the whole very successful, although not so good at Nelson as

in 1916. A full report of the work done and the results obtained from each of the experiments has been submitted. There has been a big improvement in the quality of the apples this year over that of 1916, due to the very satisfactory results obtained, both this year and last, from these experiments, and to the fact that growers of the district have made special efforts to control the scab by a thorough application of the sprays recommended by the Department.

Demonstration and Experimental Orchards.

At present there are five demonstration and experimental orchards in this district. These orchards are located at Rossland, Birchbank, New Denver, Wardner, and Waldo. These were pruned in the spring, and considerable replanting was done at Waldo, Wardner, and Rossland. Some hardier, shorter-seasoned varieties were planted in place of the more tender sorts. On the whole, most of the orchards have done well, in spite of the very dry and hot summer that was experienced during the season. A separate report dealing with the operations carried on at each orchard for the year has been submitted.

Fairs.

Fall fairs were judged during September and October at Kelowna, Heffley Creek, Armstrong, Needles, Burton, Nakusp, and Rock Creek. A report on each fair has been submitted to the Department.

Inspection-work.

This work for the year, as far as time would permit, consisted of orchard, potato, and nursery inspection in the various sections. The fruit pests, other than apple-scab and fire-blight, have been very scarce this year. The vegetable-growers have had considerable trouble with the cabbage, turnip, and onion maggots, cutworms, and the green cabbage-worm. The main potato-diseases have been scab, *Rhizoctonia*, and *Fusarium* wilt. In the Boundary section fire-blight has been quite bad again in some of the orchards, while in the Kootenay section apple-scab has been by far the worst disease to deal with. Fire-blight did not show up anywhere in the Kootenay in 1917. The nursery stock of the Riverside Nurseries, of Grand Forks, was inspected in October and a full report submitted.

Crops.

On the whole, nearly all fruit-crops of the district were light. The potato-crop was also light, while other vegetable-crops were about normal. Prices growers received this year for their fruit and vegetables have been very satisfactory. About 50 per cent. of the apple-crop in the district graded up to No. 1, which is quite an increase in this grade over that of 1916.

All of which is respectfully submitted.

E. C. Hunt,
Assistant Horticulturist.

REPORT OF ACTING ASSISTANT HORTICULTURIST, PRINCE RUPERT DISTRICT, FOR THE MONTHS OF JANUARY TO MARCH, 1917.

A. R. Neale.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit herewith my report on the work in the above district during the first three months of 1917.

It being the winter season, the ground covered by your representative was of necessity very small, and the greater portion of the time was devoted to office-work.

Institute Meetings.

Early in January your assistant attended a meeting of the Farmers' Institute at Cedarvale, where there was a fair attendance and the subject discussed was "Small Fruits." An attempt was made to organize a short course at Terrace, but owing to extensive logging operations which were being carried on this had to be abandoned.

During February a visit was made to Bella Coola and two very well-attended meetings were addressed. The subjects treated were "Co-operation" and "Better Farming Methods as applied to Local Conditions." As a result of these meetings it is gratifying to note that a local Farmers' Exchange has been organized, and it is hoped, with this and the new spirit which has sprung up in this district, that the disadvantages of isolation will be greatly overcome.

OFFICE-WORK.

During the three months prior to vacating the office, the annual reports, preparation of a manuscript dealing with Northern British Columbia, sundry correspondence with settlers on various subjects, and winding up the business connected with the office, which is to be closed for an indefinite period, were attended to. Everything has been left in the charge of Mr. McMullin, Government Agent for the Skeena District.

PROSPECTS FOR 1917.

While in some respects the winter of 1916-17 was somewhat severe in parts, yet this was on account of storms and excessive snow rather than unusual cold. On the other hand, the presence of so much snow bodes well for wintering crops and fruit-trees, and there should be very little damage experienced from winter injury as compared with the severe winter of 1915-16.

On account of the large number of men enlisting from all parts it would be unreasonable to predict that there will be greater production during the coming season than during that of 1916, yet from all indications it is certain that all those who are remaining on the land are determined to make far greater efforts than ever before, especially along the lines of producing more vegetables for home consumption.

RESIGNATION.

With the submittal of this report your assistant resigns from the Government service with regret, as the work has been of great interest and the acquaintances made in various sections of a very large district have been very congenial.

Respectfully submitted.

A. R. NEALE,
Acting Assistant Horticulturist.

ANNUAL REPORT OF PRAIRIE MARKETS COMMISSIONER.

J. A. GRANT.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my annual report as Prairie Markets Commissioner for the year 1917.

APPOINTMENT AND ACTIVITIES.

Under your instructions and following up the work instituted by my predecessors in developing the Prairie market for British Columbia products, your Commissioner's first duty last April was to examine the possibilities of British Columbia crops as a source of supply, and ascertain, as nearly as possible, the state of competitive crops in the United States, which have usually been shipped to the Prairie Provinces in competition against British Columbia.

As the shipping season was well under way before the Commissioner's Calgary office was opened, no time was lost in interviewing the large brokers and jobbers to ascertain their opinion of the possibilities of the Prairie market and to inform them of the prospective supply they may expect to handle during 1917. This involved several visits to the larger trade centres. Much information was given and received on these visits, but the consensus of opinion prevailed that if the producer wanted to fix the price of his products, the stopping of consignments, especially to the retail trade, must precede it.

Impressions.

Among other impressions gained was that British Columbia fruit was well known on the Prairies, largely due to previous advertising; that British Columbia McIntosh Red apples were prime favourites; and that "minimum weight" stamped on fruit-containers, as adopted by American shippers, and lived up to, placed British Columbia containers at a disadvantage on sale.

Your Commissioner soon found that the greatest service to British Columbia shippers could be rendered by linking up the extreme ends of the fruit business, by placing the growers and shippers in touch with the buyers, and the buyers in touch with those who had something to sell. This was the key for the year's work.

It is very gratifying to report that in every effort made to benefit trade the dealers gave their harmonious support, and market quotations were honestly and cheerfully given.

The general shortage in all lines of fruit, from all quarters of the United States and Canada, was a feature of the 1917 season.

The embargo on apples to Great Britain and Australia had not the disturbing effect that was feared at the opening of the season. The crop shortage in Ontario, Quebec, and the Eastern States gave Nova Scotia, which had a bumper crop, sufficient outlet for her surplus without exploiting the Prairie market to the extent that was at first threatened.

A shortage commenced with the Southern strawberries and was felt during the entire season, resulting in unusually firm prices for all fruits offering and big demands for former sluggish sellers, the better and more popular fruits not being sufficient to go around. Care should be exercised not to plant heavily to varieties usually in poor demand, as conditions in 1917 were abnormal and may not occur again for several years. Berry fruit has not been sent from British Columbia in sufficient quantity to fill the demand for some years, and there was little fruit preserved in 1917 for this reason.

Growing what the Market wants.

Planting suitable fruits is an imperative need, and immediate steps should be taken to regulate it, so that the popular fruits may be grown in sufficient quantities for the growing needs of the Prairie market. It is plainly apparent that far too many varieties of apples are grown and many of them should be rooted out or top-worked.

Another point needing attention is the indiscriminate flooding of the market in the late fall with winter apples, many of which are consumed out of season. Apparently, quick returns was the aim of the merchant; therefore the matter should be regulated at the shipping end.

Packing and Packages.

In some instances, especially on the part of individual shippers, the packing left much to be desired. Southern shipments were in many cases preferred, not because of the quality of the fruit, but because the packages were better filled, and it is painful to admit that in many instances both quantity and quality were judged to our disadvantage. It is evident that the United States organizations are more strict regarding rules than those in British Columbia, as every package, besides being properly marked, also had a "minimum weight" stamped on it. It was apparent that care in filling the packages well and stamping the weight on the package was well paid for in the extra price obtained for the goods.

Increasing Supply and F.O.B. Buying.

The increased supply of produce in British Columbia resulted in 1917 in the wholesale dealers of the Prairie Provinces sending their buyers into our valleys to purchase f.o.b. shipping-point. Our supply is now such that British Columbia is the leading factor in their trade, and by coming on the ground they can examine the goods offered for sale and secure a sure supply. This method has a strong bearing on steadying the price, as goods bought at market prices must be sold at a profit, and jobbers have no incentive to cut prices to secure trade, as happens under the consignment system. Wholesalers find this a clean and healthy way of doing business, as it gives them all a fair field and no favour. This method of trading is general in fruit sections, excepting in British Columbia, where the old and unsatisfactory method of consigning produce is practised to a great extent and is as unsatisfactory as it is antiquated.

REFUSAL OF PRODUCTS SOLD F.O.B. SHIPPING-POINT.

The chief drawback to this system is the never-failing claims made by jobbers at the other end, especially on a falling market. Sales subject to Government inspection at the selling end, as explained elsewhere in this report, would offset this evil, and is strongly to be recommended. When this is not possible, the cars on which claims are made, if refused, should be turned over to a competitive house on consignment, or be subject to advice from your Commissioner as to the best thing to do under the circumstances. If shippers would follow this plan the claim bogy would vanish.

UNITED GRAIN-GROWERS WANT 400 CARS OF APPLES.

The 1917 supply for this organization was largely lost to British Columbia growers. The fruit-buyers for this great organization missed securing their supply when buying was good, and completed their deal when British Columbia dealers had almost sold out and were unable to fully supply them. This organization can handle 400 cars in 1918, and perhaps the lesson of 1917 will work to our advantage then. They are beginning to see that we have the goods and our prices are right.

WEEKLY REPORTS.

The regular weekly bulletin reports were issued from Calgary as usual, from June to November. The circulation of this report has greatly increased, and the advice to shippers contained therein has been favourably commented upon in many districts. The market prices have been carefully recorded by a staff of competent correspondents and the whole field of prices reported. The f.o.b. shipping-point price, the wholesale and retail prices have appeared weekly. The bulletin was mailed every Saturday by the afternoon train, and reports up to 9.30 of that day were included in it. If the urgent requests from the wholesale trade are complied with during the coming season there will be a greater circulation, in which event it is intended to furnish this bulletin to every wholesale dealer in fruits and vegetables on the Prairies. The weekly circulation in 1917 was over 850, and with this change would reach 1,200 in 1918.

NEW REFRIGERATOR-CARS.

Owing to the general scarcity of labour the fifty new refrigerator-cars expected were not ready in time for last season's berry-crop. These cars are now reported available. They are larger than the old ones and modern in every way, and there will be no difficulty in getting the minimum weight into them. Every district that can assemble express shipments in car-lots should do so, as the limit of local express transhipments at Calgary has about been reached. These new cars should land tender and perishable produce on the market with dispatch and in prime condition.

After a season's experience at the Prairie end your Commissioner has no hesitation in recommending shipments by car-lots wherever possible.

STRAWBERRIES.

The demand for strawberries was far in excess of the supply. The general shortage in the United States virtually shut out that competition, and any that were imported from Hood River and Kennewick were sold at a high price.

Dry weather was responsible for a short crop in British Columbia strawberries in 1917. Early estimates pointed to a big supply, with a great increase in shipments to the Prairies over previous years.

The Gordon Head and Keating Associations expected to send twenty-eight cars and succeeded in shipping twenty-two, as against eleven in 1916. The Creston growers expected to ship twenty cars and only shipped equal to twelve cars, six of which were in car-lots. These are the only points in British Columbia that shipped iced car-lots of strawberries, and the condition on their arrival showed clearly the superiority of this method of shipment over L.C.L. lots.

There was no loss from shrinkage in any of the strawberry-cars, and one sent to Winnipeg arrived on Saturday, and Sunday and Monday (Dominion Day) passed before it was opened, when it was found to be No. 1 condition. Had this happened under L.C.L. conditions the car would have been a total loss. Berries shipped in iced car-lots are worth 25 cents a crate more

Clean cultivation in the Kootenays.

Fruit-packing school, Vernon, B.C., 1917.

In the valley lands of Central British Columbia.

than those shipped L.C.L., and wherever this method of shipment is possible it is strongly recommended. The car-lots were handled exclusively by the Mutual Brokers, and their work was very satisfactory in Alberta and Saskatchewan. Five cars of strawberries were sent from Victoria to Winnipeg to the Mutual Brokers there. These berries were in fine condition when they arrived in Winnipeg and the market was hungry for berries, but, due to mismanagement, the prices realized were very unsatisfactory.

Signing Contracts.—The custom of signing a contract to send all the strawberries to a brokerage concern from a given district or from the Province has its weak points. Other brokers on the Prairies have to seek elsewhere for their customers' needs, and if at all possible to meet our price they buy from United States points. It would be fair if every responsible broker had the option of buying f.o.b. shipping-point at prices set by the association, as is customary elsewhere, and if they could not get buyers for the total crop, then ship the balance on consignment or to an agent, with a proviso that they should not undersell the f.o.b. buyer. As the strawberry-supply is far below the demand, there is little chance that any will be left unsold f.o.b. shipping-point, and if the association can get along without this extra service (for which they pay very handsomely) it would be a considerable saving.

The local express shipments were very heavy and were made without any system, and the unorganized growers of the Fraser Valley were responsible for an early break in market prices that was unwarranted. The demand was far in excess of the supply, but as the Calgary retail merchants had consignments made to them without restriction they became the price-setting factor. Your Commissioner had to call dealers' attention to the unwarranted state of the prices, and this was met in a very fair spirit, but the consignments spread and no general control could be exercised. The result was that the Alberta market was shattered on a bare market.

The Japanese growers of Haney sent in a good pack of well-filled hallocks and shapely berries, but consigned them to every wholesale and nearly every retail house in Calgary, with the result that they had to meet competition against themselves, and these shippers were not alone in their folly.

Some new shippers sent in a slack pack of sandy and ill-shaped berries, which created much unfavourable comment and had a bad effect on the market. Some system of inspection should prevent such stuff from ever appearing on a distant and critical market. The home by-products plant could absorb them at a profit, whereas they were a loss to the growers which sent to Calgary, and an injury to the district as well.

There has been a decided unwillingness on the part of Prairie dealers to handle big strawberries, as they are usually lacking in uniformity; are poorly shaped and insipid to the taste. Growers should send such berries to the jam-factory or to whoever may desire them; they should not send them to the Prairies. A general organization of such growers would work wonders in their bank account, as by this means a well-regulated trade would replace a very uncertain and dangerous condition of affairs.

Salmon Arm and Armstrong sent in some very creditable strawberries, and they, with those from Creston, netted the best average price for the season for this fruit; the express rate from these points, being less, helped towards this result.

Raspberries.

Early in the season it was feared that, as a result of a freeze the previous October, the raspberry-crop of the Pacific North-west would not exceed 40 per cent. of an average. This estimate proved too true, and the competition with Puyallup was almost entirely cut off. The Fraser Valley, which has undisputed superior conditions for producing this popular fruit, had matters all their own way in 1917, but lack of organization prevented the growers from getting the full advantage that would otherwise have fallen to them. Their crop was also less than normal, and the supply was only sufficient in some cities to annoy the dealers.

Owing to the general shortage, buyers appeared in the valley and offered good prices f.o.b. for all the fruit obtainable. Several growers undertook to do a mail-order business and advertised ahead of the season at prices very far below the market. These advertisements had a depressing influence on the market, and these men had orders, far beyond their ability to fill, all paid for in advance.

In one instance a grower shipped individual crates of raspberries at $1.80 on days that he was offered $2.25 by a prominent broker for all he had at the Mission City depot. The demand

was so brisk that the association could not rally their members to concentrate and ship cars, with the outcome that only three cars were shipped in that way. Two of these contained wet berries and, as was expected, arrived in mouldy condition, and it is doubtful if the iced cars averaged as well as L.C.L. shipments; under the circumstances, the iced cars did not have a fair test and growers should not abandon the car-lot shipments on the 1917 results. All competitive berries came in iced car-lots, and some of them came in precisely the same condition at the same date. Very few cars came from Puyallup, and those which did netted a high price. These growers use the shallow pint hallock with the net weight stamped on it, and as the Prairie trade like their containers and filled hallocks they showed their preference by paying more for them than for the British Columbia ⅔-quart, although our fruits had the edge on them when shipped, but the journey under L.C.L. conditions gives raspberries a very muddled appearance. If conditions were normal the car-lot stuff would command a better price and would sell in preference. Last season's results of the respective ways of shipping did not constitute a fair test. Prices varied in different cities and the variation was governed by the amount of consignments arriving at different points, and was not subject to competitive prices or the law of supply and demand. If the Fraser Valley growers would organize and plant many times their present acreage of raspberries they would rival the famous Puyallup Valley, and be in a very enviable position financially. The Fraser Valley should be and will be the reputed raspberry-growing district of Canada when their opportunities are used as they should be.

LOGANBERRIES.

Loganberries were off in crop in 1917 due to an October freeze in 1916. The fruit has been popular on the Prairies, but a poor shipper; it will never be a great factor in the fruit-supply of the Prairies in its raw state, but its future as a preserving fruit for factory and home use would warrant its acreage being slightly increased.

BLACKBERRIES.

The Fraser Valley thornless variety was a good crop in 1917. The demand was good and a fair price realized; apart from the soft condition of this fruit on arrival towards the end of the season, there were no complaints.

BLACK AND RED CURRANTS AND GOOSEBERRIES.

Both the supply and demand for these fruits are limited, and growers in districts where these overlap their staple crop should leave their production to those that have no special line. There is little risk in planting black and red currants if labour is available to pick them when ready.

APPLES.

British Columbia apples were by far the most satisfactory to the trade, and this is gratifying as they constituted the lion's share of our offerings. Both package and pack were favourably commended.

With a view to extending our No. 1 apple market, your Commissioner would recommend the consideration of shipping the choice stock to more distant markets and shipping a smaller proportion to the Prairie market. If Nos. 2 and 3 were placed in crates and shipped under a special brand, the ordinary domestic trade would be suited about as well as they are now, at a less cost. No. 1 stock would command a higher price, being further distributed and therefore scarcer. This is briefly the policy of our competitors to the south; almost all their high-priced apples sold east of the Mississippi River, and if it is good policy for the growers in Washington State to cater to the high-class trade in the Eastern States, it would reasonably follow that the Canadian cities would absorb our finer grades at a higher price. Montreal and other Eastern Canadian cities are to-day buying Washington apples for the fancy trade, and at a price that should make us envious. Why not push our British Columbia No. 1's there? We have the goods and should go after that business.

Some consideration should be given to the spread in sizes on dessert apples constituting No. 1's. Complaints were made on several shipments that the spread was too great in the count, especially in Jonathan, Wealthy, and Winesap varieties.

PEARS.

Most of the pears consumed on the Prairies in 1917 came from the United States. In the early season market this is inevitable, but when British Columbia pears come in there is still a predominating supply of Washington stuff. The keeping season of the Bartlett variety is so short that a big planting to that sort would be unwise, but where other pears thrive well there are good prospects for an increased acreage.

This popular fruit is not well enough known on the Western Prairie market. The Winnipeg market shows the difference in price for the respective varieties in the same season. This condition will change and other markets will be just as critical when we send varieties into the market of quality and in sufficient quantities to make the difference in merit noticeable to consumers.

It would be wise to limit the number of varieties coming in at one time. A good spread in season would be beneficial; winter varieties are shortest. Prices on the Prairies were high in 1917 for good stock.

APRICOTS AND CRAB-APPLES.

Apricots were a short crop in British Columbia; they were small, but sold at a very high price. This is a fruit that seems to have little competition from the South on the Prairie markets. British Columbia apricots and crab-apples seemed to monopolize the Prairie market. Where apricots can be successfully grown there should be increased plantings, as the supply is very scarce. The Hyslop crab-apple has been in great demand and should also be further increased in acreage.

CHERRIES.

The early British Columbia varieties, such as Governor Wood and Early Richmond, are not profitable; they come in competition with Bings and Lamberts from Kennewick, Wash., and make a very poor showing by comparison. The Black Tartarian is presentable, as is the Royal Anne, but the high-priced varieties are the Bing and Lambert. Growers should think well before planting other varieties of sweet cherries. Prices were good when our cherries were presentable, and our Bings and Lamberts were very fine.

COOKING-CHERRIES.

The Olivet and Morello are the leading varieties in cooking-cherries. Prices were good in 1917, but previously did not pay their way. There is only a limited market for sour cherries and the present plantations seem sufficient to supply all demand in the near future.

PLUMS AND PRUNES.

During the season plums and prunes were in brisk demand. Some fine plums were shipped from the Fraser Valley, but developed plum-rot en route and had to be jobbed off quickly at a low price. In districts where this disease is not under control quarantine regulations should be enforced, as many cases became infected en route. If plums were free from this disease they would be welcomed on the Prairies, but as it is now dealers refuse to handle stuff from infected places.

The 4-basket crate is the favourite for plums and sour cherries, and the ability of our Southern growers in getting over 5 lb. in each basket resulted in their getting a slightly higher price than our average. As the season advanced this was largely overcome and our growers met them on the level with an equal pack.

British Columbia prunes had an off-year and sizes were under the average, but the scarcity saved the situation and good prices ruled. It is your Commissioner's opinion that prunes only should be shipped in the 14-lb. prune lug-box, unless for special purposes.

VEGETABLES.

There is a growing demand for onions, celery, beans, and potatoes, and an increasing market is assured for these vegetables.

TOMATOES, CANTALOUPES, AND CUCUMBERS.

The Okanagan Valley, Walhachin, and other up-country growers placed a greatly increased supply of these on the near Prairies; they have found it profitable, and this field can also be

enlarged. British Columbia tomatoes and cucumbers are superior to any others offered on the Prairie market.

RHUBARB.

The trade admits the superiority of the Fraser Valley shipments over Walla Walla importations. Prices were a little better in 1917 than formerly, but these suffered because the British Columbia associations did not insist in setting the price f.o.b. shipping-point.

It was gratifying to see the superiority of the commodity from British Columbia over all-comers, both in pack and quality, but, notwithstanding this fact, it realized the smallest price. This trouble can be regulated in another year if the local organizations set the price.

EXPANSION OF BRITISH COLUMBIA MARKETS.

British Columbia apples, potatoes, and onions are gradually finding favour in markets beyond the Prairies. Toronto, Montreal, and Ottawa are now buying all these three food staples from us in increasing quantities. Every car we succeed in placing in Canadian cities displaces the imported stuffs. It is only the high-class produce that cannot be produced locally which will pay to send so far. We have also sent an increased quantity of crab-apples and McIntosh Reds to Minnesota; this territory is tributary to the Prairie Markets and should receive some extra efforts on our part to further increase this desirable trade.

I regret to state that some British Columbia shippers seem to think that their operation on these markets is their individual concern, and when asked for a statement of their shipments to new markets refuse to give it. This secretive tendency on the part of shippers prevents proper attention being given to develop the possibilities of this trade. If a Markets Commissioner is to give good service, he must not only have the full confidence of those he seeks to serve, but all the information available on shipments to the markets. The growers of produce cannot hope for the best services in development of new markets if their agents (public or private) do not co-operate with them to the extent of giving the information that is necessary for the best results in the least time.

PACKAGES.

The question of uniformity of package is a hardy annual which yearly gives your Commissioners much concern. Year by year uniformity is gaining ground and only a few packages now require adjustment. Our competition comes from the United States, where packages have been standardized as the outcome of hard plodding; the growers there have had much more experience than British Columbia growers, and a close observation will show that we are following slowly in their wake in this respect. Our apple, pear, and peach crates are satisfactory, and lack but the net and gross weight stamped on them to make them equal to the best.

The 24 1-pint deep hallock strawberry-crate is now entirely used. The greatest difference is now noticed between the ⅔-quart shallow hallock crate and the shallow pint hallock crate; these are used for loganberries and raspberries; the ⅔-quart only being in use in the Fraser Valley, and the shallow pint all over the United States and in other parts of British Columbia.

The shallow pint hallock is preferred by most of the Prairie dealers, as it is a direct stand-off to the American hallock; but either or both would be satisfactory if a reasonable minimum weight were put up in them. Raspberries in bulk will shrink greatly in transit, but if the weight is there when sold purchasers know that they are being honestly dealt with. Without this minimum weight there is room for much dissatisfaction.

Every day during the shipping season complaints were registered about short weight in raspberry-packages. Without a weight standard the measure means nothing, and unscrupulous pickers can give much trouble to the grower, the jobber, and the consumer. The American competitor is compelled by association rules to give honest measure. Your Commissioner would like to see the shallow pint made general for berry fruits, but first in importance comes the minimum weight. Without a minimum weight we cannot defend our position when claims are made for short weight, even though damage in transit may have caused the trouble, and as only a small percentage of growers ship a slack pack, why should the majority of careful packers allow the market to be regulated by the minority's dishonest packers? We certainly should have a minimum weight for raspberry-hallocks.

It should be definitely settled whether apricots should be shipped in 4-basket crates, peach-boxes, or prune-boxes. At present all these aforementioned boxes are being used, which is confusing to the trade.

Advertising.

Advertising was a special feature of your Commissioner's predecessors. The result of their well-placed general advertising is apparent, and it is chiefly due to this that British Columbia fruits are so well known on the Prairies. While it seems that the day of general advertising is over for us on this market, still it must be understood that we cannot afford to neglect special advertising. During the peak of each fruit season, from the strawberry to the peach, there is a period of seemingly oversupply. It is necessary to draw the attention of the busy housewife to the cheapest time to buy a particular fruit and the best time to buy for preserving. The public press is the best medium for this purpose to ensure immediate results. These passing opportunities should be presented to her in the same way as bargain-times in the dry-goods business are presented. The wholesale and retail merchants do this advertising now in a small way, but it could be augmented with the co-operation of the growers. The result of well-placed special advertising in most cases would turn a loss account into one of profit. A fund for this purpose is a good insurance policy, which to be effective should be operated under one head.

Co-operation in Marketing.

The time has come when shippers should have an understanding as to the value of their produce; at present there is too great a spread between their quotations. Our Prairie market is undergoing a rapid expansion, and a better understanding amongst shippers as to quotations would prevent them being so much at the mercy of the middleman.

The greatest market demoralizer is the grower who finds his own market; he is unconsciously the means of much suffering and hard feeling, as he usually succeds in lowering the market for himself and others. It was the exploitation of the individual shipper by the middleman that led to the organizations of to-day. His control of price-setting and exaggerated claims on conditions of goods received forced the growers to protect themselves. It is only by organized effort that growers can protect their interest on the distant market.

Organizations must co-operate to a greater extent in the co-ordinating of prices quoted on the produce they offer for sale. The main result obtained by a proper understanding between shipping organizations would be to limit the spread, on a given date, of similar produce. An understanding of this kind, if lived up to, would prove a benefit both to buyers and sellers, by preventing hold-ups and sacrifices, and would secure a live and let-live price. It would also acquaint the growers as to the exact state of the markets and help them to regulate their crops accordingly.

If we cannot establish a mutual faith in our fellow-growers the working power of co-operation is lost. The history of such a failure shows decline in prices below cost of production, followed by a decline in production and loss of the market to those who maintain their organizations in a healthy state.

In conclusion, it should be impressed on all British Columbia growers that the Prairie market wants good sound produce honestly packed. It should be borne in mind that British Columbia is meeting competition from districts in good favour.

The shipping districts must protect themselves against the loss of a certain portion of their crop which it would be unwise to ship, by encouraging by-product factories to establish as near them as possible. It would be beneficial if interprovincial and export shipments of all perishable produce were subject to Government inspection at shipping-point; this would prevent the shipment of culls and other low-class produce that is so injurious to the reputation of the Province.

Conclusion.

There has been a strong cordiality between the growers, shippers, and brokers and your Commissioner, as well as a continuous demand for information by the jobbers and retail merchants from this office.

This report would be incomplete if mention were not made of the unanimity of purpose that prevails between this office and the Dominion Fruit Inspectors' offices, both in British Columbia and the Prairies. In every emergency that has arisen the full co-operation of their staff has been available, which has greatly added to the success and results of our efforts.

The general outlook for the future points to a rapidly increasing market and a continuation of good prices, and British Columbia's portion of the business will be in relation to our supply and the amount of energy we exert in stimulating trade.

Respectfully submitted.

J. A. GRANT,
Prairie Markets Commissioner.

ANNUAL REPORT OF MARKETS COMMISSIONER AND INSPECTOR IN CHARGE OF EXPORTS.

R. C. ABBOTT.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my annual report on the inspection-work under my charge; also on marketing conditions within the Province of British Columbia, and more especially in the Coast cities, during the year 1917.

WEEKLY REPORTS.

The weekly reports were issued regularly from June 2nd to December 22nd, inclusive. These reports dealt with the weekly market conditions and export trade. The total number sent out was 13,050. These reports were also printed in the press throughout the Province and were very much appreciated by the general public. In addition to the above, the city press was given material from time to time which would be of interest to the growers.

A large number of circulars on the canning of fruits and vegetables, potato booklets, British Columbia fruit booklets, and Department bulletins and circulars were distributed from this office.

Throughout the year the work of giving out information *re* buying and canning of small fruits was continued, a part of the work which is very much appreciated by the consumers of the City.

FRUIT INSPECTION.

This work was carried on throughout the year and used in connection with an educational campaign in the matter of putting up a better class of produce. The attention of your Inspectors was also given to export apples going through the Port of Vancouver and which amounted to 77,760 boxes.

POTATO INSPECTION.

This work was carried on, not only in regard to potatoes for export, but also field inspection throughout the growing season.

EGG INSPECTION.

Large quantities of Chinese eggs were shipped through this port in bond in the early part of the year. Your Inspectors made a determined stand to carry out the provisions of the Act, with the result that brokers decided to ship such eggs to Alberta rather than go to the expense of marking each individual egg. During the year there were twenty-two prosecutions and a conviction in every case obtained.

LOCAL MARKETS.

Generally speaking, the local markets for fruit, vegetables, and all other classes of farm produce have been excellent.

Strawberries.—These were somewhat short in supply and maintained a high price throughout the season. The greater amount came in from the Japanese colony at Haney. The berries were well packed and graded and showed a marked improvement over former seasons. A considerable quantity from Burnaby, which formerly came into this market, were shipped to the Prairies.

Raspberries.—The Coast cities received their supply principally from Burnaby, South Vancouver, and Lulu Island. Approximately 90 per cent. of these were shipped into this market

from the above districts in the local two-fifth crate. Some 500 crates were shipped from Burnaby to the Prairies during the season. While this office received but few complaints on light-weight crates of strawberries, it was continually receiving complaints on light-weight raspberries. The tolerance of the use of the local two-fifth crate gives every opportunity for short weight.

Loganberries.—These met with strong demand and prices were good. This berry is steadily increasing in demand in the Coast cities and the future outlook is indeed bright.

Currants.—The supply of currants was still short of the demand. Both black and red varieties, if put up in good shape, have been coming more in favour each season.

Gooseberries.—The past season has been the best yet for gooseberry-growers. One of the greatest difficulties in marketing gooseberries successfully has been the determined practice of many growers of picking and marketing their entire crop in one shipment. In the weekly market reports for the last three years your Commissioner has reported against this method, and is pleased to say the results obtained this past season from marketing steadily a small supply each day over a long period have doubly repaid the growers, not only by the elimination of waste, but by increased prices and weight obtained as well.

Plums and Prunes.—The supply of these came in gradually last season and, with the exception of two or three days, moved out rapidly, thus bringing the loss from plum-rot down to a minimum. The average prices were higher than usual and there was very little competition from foreign stocks.

Cherries.—Sweet table-cherries, such as Bings, Royal Annes, and Black Republicans, sold well all through the season. Early Richmonds and half-ripe Montmorencys found little call and growers usually suffer a loss on these varieties. Owing to the bulk of the Olivet and Montmorency cherries from Vancouver Island going to the Prairies in 1917, Vancouver City received very few crates of these varieties.

Apricots, Peaches, and Pears.—British Columbia supplied a very small portion of these fruits during 1917. While the total consumption of apricots in Vancouver was 8,675 crates, British Columbia supplied only 2,325, and 6,500 out of a total consumption of 62,653 boxes of peaches. The greater bulk of pears also came from outside of the Province.

Apples.—British Columbia apples now predominate on the Coast. It would appear that the old prejudice against British Columbia apples has been wiped out, and, with the exception of one firm, the wholesalers have given preference to home products.

The heavy imports during 1916 and 1917 have been during the months of February, March, and April, when there was not a sufficient supply in British Columbia. With the stock on hand on December 31st, 1917, and the available supply yet in the Interior, it would appear as though these three months of 1918 will not see any large amount being imported from the United States.

Potatoes.—Much attention has been given to the development of the potato market, both local and export. The results gained, although slow, have, it is believed, been very beneficial to the growers. In three seasons the average price at digging-time has risen from $7 to $24 per ton.

During the shipping season for the 1917 crop a most perplexing economic question confronted your Inspectors, as to how it would be possible to eliminate the waste on the market, due to shrinkage from diseases, principally late blight in shipments from west of Yale, and jelly end-rot in shipments from the Interior. On examination, it was found that shipments resorted in Vancouver showed as high as 70 per cent. infection, and many with an actual loss of from 3 to 15 per cent. This was a great economic loss, especially to growers. They were not only losing stock they might have fed to hogs or other stock on the farm, but they were compelled to pay freight, resorting, and incinerator charges. Also the already overworked transportation facilities were being utilized in carrying stock which turned out to be a total loss as food. A hurried survey showed the major portion of the wastage coming from the Districts of Chilliwack and Agassiz. Steps were taken at once to try and stop, if possible, this unnecessary wastage by inaugurating an inspection service at the shipping end.

While the inspection-work no doubt saved the growers, shippers, and consumers untold financial loss, it also demonstrated clearly that, no matter how careful the inspection might be, it is impossible to always detect conditions causing serious losses on the market.

Just previous to and during the planting season of 1917, demonstrations and lectures on the treatment and selection of potato-seed were given each Friday at the New Westminster Market. These lectures created much interest and were well attended by farmers. This same

work was carried on throughout the Lower Mainland by your Inspectors, who visited 1,032 farms during the season.

While powdery scab was very prevalent in 1916, only a slight trace was found in 1917.

Two Chilliwack farmers who have for the past two seasons been following the recommendation of this office in the selection of seed and planting of seed-plots claim to have increased their yield of marketable potatoes 30 to 50 per cent.

During the year the inspections were as follows:—

Total potato inspections	5,832
Total cars passed for export, January 1st to December 31st, 1917	766
Total cars condemned	541
Total cars inspected in city for local use	333

Tomatoes.—The British Columbia crop of both hothouse and field tomatoes was marketed with more satisfactory results to the growers in 1917 than in any previous year. It might be said that the shipments totalled more than 60 per cent. of those in 1914. The wastage was so small that it cannot be recorded as against the loss of some eight cars in 1914.

The home canning of tomatoes in the City of Vancouver is increasing each season. Since the arrival of the tomatoes from the Keremeos District, which are far superior in flavour to those produced in other districts, the table consumption has increased wonderfully.

Beans.—The production of beans was much greater than in former years. These have found a ready sale at good prices when car-loads could be made up.

Other Vegetables.—With the exception of onions and carrots, other table-vegetables have been scarce, and a great deal of difficulty was encountered in finding a supply for export trade.

In the month of March a very large shipment of Australian onions was received in Vancouver, but owing to heating in transit became almost an entire loss. During the month of November there was a heavy storage of British Columbia onions in Vancouver, and at the end of the year these showed approximately 70 per cent. growth. Speculation in onions during 1917 has caused a great wastage of foodstuffs.

Farmers were encouraged by the evaporators to grow red carrots and onions. These evaporators then bought their supply of carrots and onions from California early in the season before British Columbia stocks were ready for use; consequently, the growers on the Lower Mainland have their stocks still on hand.

The export demand for mixed cars of vegetables is gradually increasing, and our trade has suffered a great loss this season on account of the shortage in cabbage, parsnips, and beets.

There was a decided increase in the shipments of British Columbia peppers and egg-plant from the Okanagan Valley.

Rhubarb.—This office has encouraged to some extent the growing of forced rhubarb, and growers who are giving attention to this part of the industry have indeed done well during 1917. This produce was found on the Vancouver market almost continually from January 1st to August 1st.

Cucumbers.—In the early part of last May all assistance possible was given to a new pickle company who were desirous of starting in Vancouver. They were able to contract and arrange with some growers to grow pickling-cucumbers, and although it was late in the season before arrangements could be made, the pickling company are satisfied with the results, and it is understood the growers did as well as could be expected. Encouragement has been given to this industry for the past four years, and it is one which we believe has a very bright future before it. This company will extend their efforts to the Okanagan Valley in 1918, and will also take cauliflower, beans, etc.

SUMMARY.

Summing up the situation for the year, it was found that there was very little loss in wastage of foodstuffs in Vancouver as compared with other years.

Every effort has been made on the part of this office to assist wholesalers and dealers of foodstuffs where the movement was slow. The marked improvement in the packing and grading of fruit and vegetables has a great deal to do in the elimination of this waste. Where carelessness was shown on the part of the producer in the shipments of fruit and vegetables into the city, this office took the matter up direct, and if necessary visited the farm and gave instructions as to the proper methods of packing and grading. Assistance was also given in the marketing

of dressed meats and poultry, and, when complaints were made, assisted in adjusting same to the satisfaction of both shipper and dealer.

Producing shippers have been protected in their collections. In every case where farmers notified this office there has been no loss whatever. This is a very important branch of the work of this office, and growers in general appreciate it very much.

Respectfully submitted.

R. C. Abbott,
Coast Markets Commissioner and Inspector in Charge of Exports.

REPORT OF SOUTHERN OKANAGAN FRUIT AND VEGETABLE EXPERIMENTAL STATION, SUMMERLAND.

J. L. Hilborn.

M. S. Middleton, Esq.,
Provincial Horticulturist and Inspector of Fruit Pests,
Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit my annual report on the work of the above station during the year 1917.

Peppers.

There were grown 3,240 plants of sweet peppers, which yielded 142 peach and 326 apple boxes of fruits at a total cost of $220.70, including allowance for rent of land, also all taxes, fertilizers, boxes, and all expenses incurred in growing and marketing the crop, which brought a gross return of $820, leaving a net balance of $599.35 for the $^{5}/_{11}$ acre grown.

As usual, the seeds were started in the greenhouse early in March, and twice transplanted before going to the field. They were planted in rows which were 3 feet 4 inches apart, the plants being set about 20 inches apart in the row, and given very thorough cultivation throughout the season, and irrigated when they seemed to require it.

We are ever striving to produce or obtain better varieties of peppers as well as other vegetables, and this season grew two varieties obtained from the South which gave excellent satisfaction—Pimento, a medium-sized pepper of very smooth and perfect form, and very heavy, the flesh being fully a quarter of an inch thick. The other new variety, called Giant Neapolitan, promises to also be a valuable variety. It is a large early sort, worthy of further trial, and it is hoped to improve it by selection.

The land for this crop was prepared as described for the growing of cucumbers.

Tomatoes.

As in the case of cantaloupes, the chief commercial crop of tomatoes was grown on a neighbouring farm, but a portion was also grown at home. In both cases the crop was quite satisfactory as to yield and prices obtained, showing a net balance per acre of about $670 over total cost of production.

As heretofore, the seeds were started in the greenhouse, but this season the first sowing was done a little later than heretofore, and it is thought that March 1st is sufficiently early for starting. The plants were transplanted three times, each time into other flats, and given more space, as is done in the growing of all vegetables grown in this way. The flats used for this purpose are 12 x 22 inches, inside measurement, and 4 inches deep.

For the last transplanting with tomatoes, cucumbers, and melons, only eight plants were put in a flat. Hence in moving to the field they receive no check. This enables the bringing of the crop forward much earlier than would be possible if the root system was disturbed in transplanting.

Regarding varieties, while we are still obtaining good results from the Bonnie Best, the bulk of the crop is still produced from Earliana, and, although testing many other varieties, we have been unable to discover anything as good if a good type of seed is used. Best results have been obtained from seed procured from H. P. Langdon & Son, Constable, N.Y. By selecting fruits from the best plants throughout the field, and repeating this year after year, has enabled the production of a type as good but not better than that purchased from the sources referred to.

While some growers claim to have had good results from planting tomatoes on rich soil, the same cannot be said of the results at this station, as the plants grow so large that the crop is produced too late to secure satisfactory prices. This station obtained the best results from soil of only moderate fertility.

EGG-PLANTS.

From $^{5}/_{12}$ acre in 1917 662 apple-boxes of this valuable but little-known vegetable were produced at a total cost of $293.30, which sold for $829.80, leaving a net balance of $536.50.

The seeds for this crop were started under glass, and the plants handled in much the same way as described for peppers, and the crop is cultivated and handled in much the same manner. This crop, as well as the peppers, requires a rich soil and thorough cultivation. These plants require more space in the field than do peppers, as they grow larger and have a much stronger root system. The rows were planted 3 feet 8 inches apart, and the plants about 34 inches apart in the rows.

The same result applies for this crop as has been mentioned for the other crops; the season being warmer and longer than ordinary, the yield was unusual.

This vegetable is not very well known in the majority of markets; we were able to increase the sales to a great extent by having printed circulars describing how to treat and cook this vegetable, placing a few of these in each box when they were packed. This apparently is causing a rapid and continued increase in the quantity sold to the different dealers.

CANTALOUPES GROWN, 1917.

At the home station this last season only a small quantity of melons were grown, chiefly for the purpose of testing new varieties, while the commercial crop was grown on a farm near by which was rented from the owner, who was at the Front. The season being warmer than usual, the cantaloupe-crop was a remarkably good one, the fruits being much larger than usual, causing the yield to be better than in previous years, a net return of about $870 per acre being realized. The seeds were started in sand on April 19th, and the plants transplanted three times before setting in the field the first week of June, after which they were given very thorough cultivation. As soon as the fruits began to ripen they were gone over every week-day and all fruits from which the stems would slip with reasonable pressure were gathered.

For the main crop the variety called "Hoodoo" was grown, but this was crossed with a much larger and earlier variety, and, judging from the first cross, it will be possible to obtain from this a larger and earlier sort, which will be very desirable if the flavour and shipping qualities of the Hoodoo can be maintained as we hope.

There is a wide market available for this crop if the right varieties are properly grown and marketed; there is little fear of overproduction, as is the case with cucumbers and some other crops.

CUCUMBERS.

From $1^{4}/_{9}$ acres of cucumbers there were harvested 5,445 peach-boxes of fruits at a total cost of $1,281.90, which sold for $3,728.30, leaving a net balance of $2,446.40.

The seed used was a three-year selection of our own, starting with some saved from selected plants grown from seed of Stokes' Hothouse Perfection, and no doubt the selection of seed used contributed somewhat to the heavy yield of uniform fruits that was obtained. The seed was planted in sand on April 18th, and the plants transplanted three times before taken to the field in the first week of June.

About $^{1}/_{3}$ acre of the above amount was grown from seed planted on May 21st directly in the field; these were given extra care and nursing in an endeavour to produce a profitable crop in that way, but with all the care the crop failed to develop until the market was well supplied and the price such that the average was reduced to such an extent that it is not the intention to grow any more in that way. These, as well as the plants started under glass, were grown in rows 4 feet 8 inches apart, the hills, containing one plant each, being 3 feet 6 inches apart in the rows. The whole plot was cultivated about once a week for nearly the whole of the growing season and was kept fairly well irrigated, but if more water had been available it is thought the crop could have been increased by at least 15 per cent.

As the weather was much warmer during the past season and continued for a longer period than usual, the crop of cucumbers, as well as that of the other warm-season vegetables, was

better than ever before, but this was partially due to the fact that the same plot of land has been used for these crops for four years, and each season the land given a more thorough preparation than the last, including a fair application of well-rotted stable manure which is not all used by the crops the first season.

Each year, as soon as the crops are harvested, the old vines which produced them are removed and the land given a good working with a spring-tooth or orchard cultivator, then whatever manure is available is applied and worked into the soil by more cultivation; the land is then well ploughed late in autumn. In the spring, as soon as the land is in good condition, it is well cultivated again, and the plank drag used to pulverize any small lumps that have formed; it was then ploughed, plank-dragged again, and before planting the cultivator and planker passed over the plot once more. The soil being a gravelly loam, the amount of labour used in preparing the land for vegetables would be too much for a very sandy soil, but there is no doubt that it will pay well on most soils.

(For statement showing receipts and expenditures in connection with the station during the year 1917 *see* Appendix No. 5.)

Respectfully submitted.

J. L. Hilborn,
In Charge.

ANNUAL REPORT OF PROVINCIAL PLANT PATHOLOGIST.

J. W. Eastham.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I have the honour to submit herewith my annual report for the year 1917.

New Diseases.

A fairly comprehensive plant-disease survey has now been made of the fruit-growing districts of British Columbia, and the diseases at present to be found or to be guarded against recorded. No new disease of economic importance has been noticed during the past year. The only observation worthy of being recorded during the past season is the occurrence of a case of mushroom root-rot in an apple-orchard in the Shuswap District. The main axis of the tree from the crown downwards was completely rotted by the fungus, the mycelium of which was obvious to the naked eye all through the rotted tissues. The characteristic rhizomorphs were also present in abundance. The owner of the orchard complains that nearly his whole orchard is dying from apparently the same cause. Unfortunately this case was brought to the attention of this office too late in the season to visit the place, but the disease is of sufficient interest and importance to warrant some attention next season. This is the first authentic case of the diseases from the Mainland, although your Pathologist has looked very carefully for it, as it is well known in the Pacific Coast States. The fungus apparently is present on the roots of the natural trees and shrubs of the bush, and the only way of avoiding the disease in the orchard would appear to be the removal of the old roots, etc., from soil as completely as possible, and the growth of field crops on the land for two or three years before planting out to orchard. Not only apple-trees, but most varieties of fruit-trees and some bush-fruits are liable to be attacked.

Field Experiments.

Apple-tree Anthracnose.—Last year an experiment was begun, in co-operation with the Horticultural Branch, to ascertain the relative value, in the control of this disease, of spraying at different dates in the fall. It is known that the disease can be largely controlled by fall spraying, but that this work must be done before the heavy fall rains begin, since it is through these rains that infection with the fungus takes place. With late varieties, however, to be sure of spraying in time, it is necessary to do this before the fruit is picked. Growers have been averse to this, since it means extra trouble and expense in wiping the fruit. The experiment was designed to test the relative efficacy of spraying before and after the rains had begun and the extra cost in the former case. It was necessary, therefore, to use a late variety susceptible to the disease.

A summary of the results of the first season's work was published in the *Agricultural Journal*, and it is only necessary to state here that the results were decisively in favour of the early sprayings. When trees had one spraying given on September 6th, only 11.4 per cent. of the first- and second-year-old growth was attacked by anthracnose, whilst on those not sprayed until November 8th, 77 per cent. was attacked. Where both sprayings were given the infection was 7.2 per cent. These figures show well the relative value of the two sprayings, which is further emphasized by the fact that most of the infections on growth of this age result in the death of the branch above the point of infection.

The most surprising thing, however, was the fact that no extra charges were incurred in handling the fruit as a result of the adhesion of Bordeaux mixture. The apples were placed in cellar storage until after Christmas, and when they were then packed the Bordeaux mixture was found to have disappeared, possibly having been detached as a consequence of the sweating of the fruit.

The experiment is being continued, and will probably have a still greater advantage for the early spraying as the disease comes more under control.

In this connection it is of some interest to note the curious ideas which an ignorance of the real cause of a parasite plant-disease still renders possible. A certain gentleman having memoralized members of the Cabinet and others in reference to a specific remedy which he had discovered for anthracnose, I made an investigation of his claim. The method of procedure consisted in slitting up the developing cankers in eary spring, and injecting by means of an oil-can a coloured liquid, whose composition is a profound secret. This method of treatment ignores altogether the fact that infection takes place in the fall, and that the canker ceases to extend by the time growth has well begun. Naturally, therefore, the canker does not develop much after treatment, as it is due to stop in any case. On the other hand, such treatment can have no influence in lessening new infection. It is known that shaving off the surface of a developing canker and allowing it to dry out will check it, but this would only be of practical value where the cankers are small, at which time they are not easy to see. In any case, the process is too tedious to be of much value, and it is more important to prevent an infection than to treat the cankers after they have developed. Effective protection can be obtained by spraying as in our experiment.

Apple-scab.—Apple-scab was not so prevalent this season as in 1916, and the results of our experiments last year had convinced many growers, who had become discouraged, that scab is a controllable disease. As a consequence spraying has been more extensively and more carefully practised. From the nature of the case it is not possible for the Plant Pathologist to be present personally at the picking and counting of the crop on all the experimental plots. This year he devoted most of his attention to the experiment in the Kootenay, since it is there that the disease is of most economic importance. The results at Nelson were not as good as those obtained in 1916, owing probably to the fact that it was necessary to have some of the spraying this season done by Chinamen. It is probably not desirable to give a full account of the results here, but the following contrast between two McIntosh trees, one sprayed "commercially" (that is, three sprayings, "pink," "calyx," and two weeks later), and a check-tree, may be given:—

	No. of Apples.	Total Weight.	Weight Clean.	Weight Scabby but Marketable.	Weight of 60 Best.	Weight of 50 Worst.
		Lb.	Lb.	Lb.	Lb.	Lb.
Check	459	65	...	13	13	3
Three sprays	611	143	89	39	19	9

Although the check-tree was, if anything, more favourably placed than the other, it had not a clean apple on it, whilst the greater proportion of the fruit was absolutely useless for any purpose whatever, as may be judged from the fact that the fifty worst apples weighed less than 1 oz. each. It was also difficult to pick out the worst, there being so little to choose amongst them. On the sprayed tree 58 per cent. of the apples by count and 62 per cent. by weight were perfectly clean, and a further 31 per cent. by count and 27 per cent. by weight, although slightly scabby, were still marketable.

Another interesting feature is the greater set of fruit on the sprayed tree. It has been contended that the use of lime-sulphur in the "pink" stage or later is likely to bring about a serious dropping of the fruit. None of our experiments to date have indicated this, although for the "pink" spray a solution of 1-30 was used, probably somewhat stronger than necessary for scab-control.

The past season at Creston was not so conducive to scab as that of 1916, but there was sufficient to demonstrate the value of spraying. Owing to some misunderstanding on the grower's part, this office was not informed in advance as to date of picking the fruit, and therefore no detailed analysis of results was possible. Field observations made on August 18th showed that where two or more sprayings had been given, no scabby fruit could be found and very little scabby foliage. On the check-trees 75 per cent. of the fruit was scab-infected, although in most cases not sufficient to materially reduce the size, only the market grade.

Peach-worm, or Twig-borer (Anarsia lineatella).—This insect is becoming a most serious pest of the peach and apricot crop in the Southern Okanagan. It is only recently that it has begun to attack apricots, and apparently still prefers peaches. Where the latter are few in number, however, apricots are being very seriously attacked, and where the insect is on the increase its attacks on apricots are becoming more frequent. This is much to be regretted as the apricot has hitherto been a crop much in favour with the growers, not only on account of its value as a market crop, but owing to its comparative freedom from pests and disease.

The peach-worms winter over in the larval stage in the crotches on the upper part of the tree. In spring these worms eat the young growth, hence the name "twig-borer." These larvæ pupate on the tree and give rise to a moth, and the eggs then laid give rise to another generation of larvæ which attack the fruit. It is this attack on the fruit that is chiefly serious with us. Numerous observations in the Southern Okanagan have convinced your Pathologist that where spraying with lime-sulphur is done as required for peach-leaf curl, this will largely control the twig-injury from over-wintering larvæ. This is confirmed by the experiments at Summerland carried out by J. Tait, Inspector for that district. Hardly a worm could be found at this stage on the sprayed trees. Since, however, the moth is winged, such spraying gives no protection against the brood which enters the fruit, since the female can migrate from any near-by unsprayed orchard to lay her eggs. Moreover, it is much more difficult to protect the fruit by spraying against this phase of attack. There is good reason to believe that one thorough spraying of peaches, apricots, and perhaps prunes, with lime-sulphur, between the time of the first swelling of the buds and the appearance of the pink of the blossom in the opening buds, would control the pest; but it is absolutely essential that all trees of these species be treated. Control of this pest is as much a community matter as is that of fire-blight. The difficulty, however, lies in the presence of so many abandoned lots with peach-trees, especially in the vicinity of Summerland. The simplest and most satisfactory means of dealing with these would be to cut them down and burn them, but this is perhaps rather a drastic measure. It may be that the shortage of water during the past season will help to give the finishing touch to many of these trees. It is certainly advisable that spraying with lime-sulphur, not weaker than 1-12, between the time of the first swelling of the buds and the showing of the petals be practised for peach and apricot trees in the districts of the Southern Okanagan from Peachland south to Keremeos.

The share of the actual spraying operations which it is necessary or desirable that the Government should undertake cannot be decided upon until certain data, which are now being collected by the district horticultural officers, can be worked over. These include the number of trees to be sprayed and the number of machines available in the areas under consideration. In any case, it is intended to conduct an educational campaign through the medium of institute meetings and through the press in the early part of the year.

Fire-blight.

A considerable amount of fire-blight was present in the Okanagan during 1917, although it did not assume the proportions of an epidemic. There was apparently a little primary infection of the blossoms, which developed slowly, forming a focus for numerous secondary infections on the twigs later in the season. The late development of the disease prevented the injury from becoming as serious as would otherwise have been the case. Much of the trouble is to be explained by the absence of skilled labour to cut out the dormant cankers or to detect and remove the earliest infections.

The worst injury, however, from fire blight was at Grand Forks, and apparently due to deliberate neglect. Many of the farmers there have replaced much of their orchards by agricultural crops. Those who intend continuing this process are apparently very negligent of what happens to their trees, as they intend to take them out, anyway. Unfortunately, while they remain in this neglected condition they are a menace to those orchardists who wish to make the most of their fruit land. The worst fire-blight infection seen this season was in a block of Transcendent crabs here. As the grower proposes to take them out this winter, a fruitful source of infection will thus be removed.

POTATO-DISEASES.

In view of the increased importance of the potato-crop as a source of food-supply at the present time, it is very regrettable that so much disease should be present with the 1917 crop. Much loss occurred in the field and during transit, and it is to be feared that there will be a large shrinkage in storage.

In the past two seasons, owing to the increase in the powdery-scab infestation, attention has been given by this Branch to bringing before the growers the necessity of more care in the selection of seed free from disease, and the advantage to be derived by disinfecting the seed as a safeguard against surface-borne diseases. Early last spring a special circular was prepared, giving detailed instructions for treating seed. This was widely distributed. Seed-disinfection, however, is no safeguard against internal diseases, and owing to the scarcity of seed last spring it is to be feared that much seed of an unsatisfactory character was employed. The diseases which have caused so much loss this season have not been the surface-borne ones, but the internal ones, especially late blight and certain *Fusarium* rots.

LATE BLIGHT.

Late blight has been very widespread. Specimens of tubers affected with it have even been found in potatoes from the Ashcroft area, although the Dry Belt is usually quite free from the disease. There is only one effective control measure—namely, the spraying of the tops with Bordeaux mixture three or more times during the season. If the disease can be controlled in the tops the tubers will not be affected. In Eastern Canada this practice has now become well established owing in part to the presence there of the Colorado potato-beetle. This pest is so destructive that unless the grower sprays for it he will get no crop. Since he has to spray for this in any case, it is comparatively little extra trouble to add Bordeaux mixture to the Paris green and control both the potato-bug and the late blight. It has, of course, been objected that since late blight does not occur in epidemic form every year, the money spent on spraying may be thrown away. It has been shown, however, by repeated experiment that, even when no blight should occur, the spraying pays for itself in increased yield. Bordeaux mixture has a stimulating effect on the foliage, resulting in more assimilation and a longer growing season, and hence in the larger yield. Whether this would be true or not with the present high cost of production, it is difficult to say.

FUSARIUM ROTS.

Several of these have been determined, and the amount of loss, especially in transit and in storage, due to these diseases is very great. *Fusarium* rots take the place in the Ashcroft District of the ever-present late blight at the Coast. Another form is very prevalent in the Delta District. Many field observations have been made and laboratory studies, but experimental field-work is now desirable to settle a number of points in the life-history of these parasites.

SILVER SCURF.

Silver Scurf (Spondylocladium altrovirens).—This disease has been found to be very frequent in the Coast and Island sections. The sclerotial stage, however, has been met with only rarely. While the disease is not very serious, it can only be controlled by seed-selection; although it is of a superficial nature, seed-disinfection does not seem to be effective.

CODLING-MOTH.

Investigations under the direction of R. C. Treherne, Provincial officer of the Dominion Entomological Branch, have now been well advanced. The results of these investigations will ultimately be published by the Dominion Government. At the same time, information for

immediate practical use has been supplied to those officials of the Department employed in suppressing outbreaks of this pest.

When the material being bred through in the insectary at Vernon reached the critical stages, the aforesaid field officers were at once notified and took measures of spraying or banding accordingly. These operations, therefore, were based upon definite knowledge, and not on probabilities affected by the judgment of the individual and the character of the season.

The codling-moth conditions in the quarantined areas of Westbank and Okanagan Landing are showing great improvement. The Westbank infestation is now well under control, only forty-eight larvæ being found during the entire season. These were all found in eleven orchards, fourteen orchards previously infested being found to be entirely free. A further result of the quarantine-work in this district is the clean and healthy appearance of the orchards as a whole and the excellent grade of fruit produced. The rosy aphis of the apple (*Aphis sorbi*), which was becoming a serious pest in this district three years ago, was not observed to be present during the past season.

At Okanagan Landing the infestation has been greatly reduced; the total number of larvæ found during the past season was 550, being a reduction of over 50 per cent. as found in the year 1916. Furthermore, the area of infestation has been greatly reduced, being now confined to two adjoining orchards with a small front yard of about thirty trees still in doubt.

Vernon Office.

This office, as heretofore, is in charge of Mr. Ruhmann, and is the centre for the entomological work of this Branch. The most important piece of work has been the codling-moth investigation, which has already been noticed. Work has also been carried out in co-operation with Mr. Tothill, in charge of Natural Control Investigations in the Entomological Branch of the Dominion Department of Agriculture. In this connection Mr. Ruhmann spent two weeks at Lillooet investigating an outbreak of spruce-bud moth (*Tortrix fumiferana*). This pest was doing much injury in the area specified, and it was important to collect data on its natural enemies, since ordinary control measures are not feasible. Work along these lines was also done with the cherry-tortrix (*Archips cerasivorana*), tent-caterpillars, and oyster-shell scale. In the last-mentioned case a predatory mite collected in Eastern Canada and sent out by the Dominion Entomological Branch was placed out and is being kept under observation, in the hope that it may assist in the control of this pest.

An undetermined species of wireworm was found doing much damage to the onion-crop at Vernon and Kelowna. A bait of rice-bran, molasses, and arsenic was found very effective in controlling it. The materials were mixed to form a stiff dough, and small balls of it were placed just beneath the soil between the rows. These proved a great attraction, and when examined three days later were found to contain a large number of the dead wireworms.

An apple-miner of a very unusual character was found at Creston and sent in by the Provincial Horticulturist. Only one reference to such an insect could be found in the literature at our disposal, and the insect was not named. It was determined, however, by A. L. Quaintance, of the Bureau of Entomology, Washington, D.C., as the work of a small moth, *Marmara pomonella*, an insect only described in 1915. As this would be a serious pest should it increase, a photograph of its work is appended, and it is requested that specimens of any similar injury be sent to the Vernon office.

The cage used for the past two years for the study of the life-history of the codling-moth has been removed from its site, and will be erected on the grounds at the rear of the Vernon Court-house in the spring of 1918. A further sectional addition measuring 12 x 16 feet is being constructed as an addition to the cage, the cost of the material for this work being borne by the Entomological Branch, Ottawa. This will make a commodious insectary measuring 12 x 28 feet, and will be used for rearing, and studying the life-history of, the insect pests most prevalent in the Okanagan Valley, and will also facilitate the making of life-history sets of economic insects for distribution and exhibition purposes.

The collection of insects has been largely increased during the year. The collection of the late E. S. Wilmot, of Coldstream, has also been donated to us by Mrs. Wilmot. It is strong in specimens of Coleoptera, containing a considerable number of species new to our collection. A collection of Lepidoptera has also been presented by F. B. Jacques, of Vernon. We take this opportunity of expressing our thanks to these donors.

A new sectional insect-cabinet is being purchased for the housing of our collections, the previous accommodation having proved unsatisfactory.

It is gratifying to note that the Vernon office is being increasingly visited by Okanagan growers who are troubled with insect pests or diseases. The absence for a considerable time of any officer in charge, and later the removal of the office from the Smith Block to the Court-house, probably caused some falling-off in personal inquiries, which are in most cases the most satisfactory form of inquiry.

EDUCATIONAL WORK.

In addition to attending various institute meetings, your Pathologist took part in the short course at Summerland in February, as did Mr. Ruhmann, who lectured on insect pests. Your Pathologist gave a series of five lectures on plant-diseases at the short course in horticulture at the University of British Columbia in January and three lectures at the similar short course held in November. In July the summer school for teachers was attended, giving part of the course in botany and also a series of lectures on plant-disease.

Over eighty Riker mounts of plant-diseases have been prepared during the past year and are now being distributed. A number of similar insect mounts have been made up, although the number so prepared have been less than expected. A large quantity of material was collected during the summer of 1916, but most of it failed to survive the Vernon winter in the accommodation available. The new insectary should prevent a similar occurrence in 1918.

Considerable attention has been given to preparing a good exhibit on diseases and insect pests for the fall fairs. Such exhibits were shown at Vancouver, Duncan, Coquitlam, Langley, Kelowna, Grand Forks, Nelson, and Summerland. The exhibit at the Upper Country fairs was in charge of Mr. Ruhmann, except at the last named, where personal charge was taken. Much interest was shown, especially in the fruit-growing districts.

In addition to regular duties, the bacterial tests in connection with the Dairymen's Association milk competition were again made.

In the past the major part of the Pathologist's time has been spent in making a survey of the Province for plant-diseases; in taking up difficulties with individual growers; in going around with District Horticulturists and Inspectors, inquiring into the more obscure or difficult cases of disease; and in connection with the field experiments on anthracnose, apple-scab, peach-curl, twig-borer, etc.

Owing to the extent of the Province, this necessitates being away from the laboratory a great deal, and it is very difficult to keep investigational work going. The spraying experiments now under way should be concluded in 1918.

Respectfully submitted.

J. W. EASTHAM,
Provincial Plant Pathologist.

ANNUAL REPORT OF INSPECTOR OF IMPORTED FRUIT AND NURSERY STOCK.

W. H. LYNE.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit my annual report on the inspection of imported fruit, nursery stock, vegetables, rice, corn, beans, and peas during the year 1917.

STAFF.

The work of this Branch has been carried out by a staff of officials recorded as Inspector of Imported Fruit and Nursery Stock, first, second, and third assistants, and clerk-stenographer, stationed at Vancouver. Extra men, under a foreman, have been employed at the fumigation and inspection station, when required, for the work of unpacking and repacking trees, shrubs, plants, etc., during process of inspection and fumigation.

Fruit Inspection Quarantine Officers, under direction of your Inspector, are stationed at Victoria, Nanaimo, Prince Rupert, Abbotsford, Huntingdon, Similkameen, Midway, Grand Forks, Cranbrook, Newgate, Cascade, Kingsgate, Fernie, Rossland, Waneta, Revelstoke, and Bridesville.

At Penticton and Osoyoos, in South Okanagan, and Rykert, near Creston, the Customs Officer at each place looks out for any infected fruit that may be brought across the boundary by way of wagon-road. These three last-mentioned men were employed only through July, August, September, October, and November, during which months there is most danger of codling-moth being brought across the boundary by tourist or other traffic.

The Pea-weevil from Eastern Canada and United States.

The pea-weevil (*Bruchus pisorum*) is an insect of considerable economic importance with which this office has had to deal. Owing to the fact that up to the present it has not become an established pest in British Columbia, and knowing the havoc it has caused in Eastern Canada and certain parts of the United States and Europe, every possible precaution should be taken to keep it out. With that aim in view, all shipments of peas entering the Province have been carefully inspected, and if found infected with any sign of live weevil were immediately ordered to the fumigating station at Vancouver or Victoria, where they were thoroughly fumigated with carbon bisulphide at the expense of the importer. This remedy, properly applied, has been found very effective.

During the early part of the year, when several Eastern Canadian seed-houses were shipping in their spring garden seed, considerable trouble and annoyance was caused in having to open sealed packets containing peas. After a diligent inspection of such packets no live infection was found, and in order to avoid further trouble the shippers agreed to furnish a guarantee that all such stock had been properly disinfected. This arrangement was accepted by the Department as applying to sealed packets only, stipulating that the inspection of peas, beans, and corn in bulk should continue, and that freedom from infection of such shipments should govern the concession granted to the sealed packets.

Pea-weevil from Japan.

Several hundred tons of peas from Japan have arrived at Vancouver, some of the consignments being infected with the live weevil, necessitating prompt fumigation. This illustrates the fact that the Inspectors have to be continually on guard against this destructive insect invading the Province from many directions.

Bean-weevil.

The bean-weevil (*Bruchus fabæ*) is a very close relative to the pea-weevil, and can be just as destructive. We may congratulate ourselves on being free from this pest in British Columbia for the time being. Consignments of beans infected with live specimens of this insect have arrived at Vancouver and Victoria from California, Peru, China, and Japan. In a few shipments the beans were so badly riddled with the weevil as to be of very little value, and were refused entry. The other shipments were fumigated.

The heavy importation of beans and peas has been largely in connection with Army supplies.

Potato-tuber Moth.

The potato-tuber moth (*Phthorimea operculella*) is another very serious insect pest that has not yet troubled this Province, and for which California potatoes are barred entry into Canada.

On May 8th, 1917, the S.S. "Waitotara" arrived at Vancouver with 9,759 crates of potatoes from Australia badly infested with the tuber-moth. The whole consignment was refused entry and taken to San Francisco, to which port it was originally consigned.

Mediterranean Fruit-fly.

All consignments of fruit and vegetables coming from the various latitudes in the Pacific Ocean are carefully inspected for any sign of the fruit-fly (*Ceratitis capitata*), about the most destructive insect known to many kinds of fruit and vegetables.

All fresh fruit and vegetables from the Hawaiian Islands were barred entry into Canada for reason of this pest. The Hawaiian Islands, however, is not the only place in the Pacific where the fruit-fly exists, and it is never known what shipments arriving from other parts may carry infection.

INSECTS INFECTING RICE, CORN, AND STORED PRODUCTS.

The object of inspecting imported rice, corn, peas, beans, and other cereals, or stored products, not only applies to insects affecting field or garden crops during growing period, but also to those insects that are often so objectionable and injurious to the stored product. The Mediterranean flour-moth (*Ephestia kuchniella*), Indian-meal worm (*Plodia interpunctella*), the Angoumous grain-moth, the flour-beetle (*Tribolium confusum*), Tenebrio worm, rice and granary weevil (insects infecting stored products) have been imported during the year with rice, peas, beans, peanuts, etc. These particular insects do not apparently survive confinement to a cold storehouse, but will flourish and become a general pest in warm stores or storehouses. It has therefore been the practice during the last twelve years to fumigate all imported shipments of rice, corn, beans, peas, etc., that are infected, in order to prevent the imported insects becoming a serious pest in our wholesale and retail stores.

This ruling has had a good effect on recent importations in general, as shipments seldom arrive so badly infected as in previous years.

RICE-MILLERS' PROTEST.

On July 12th, 1917, a meeting of the Board of Horticulture was held at the office of the Inspector in the Court-house, Vancouver, which was attended by a deputation of the Vancouver rice-millers, who presented a formal complaint against the expense and delay incurred in the fumigation of infected rice. They also expressed the opinion that fumigation of rice was not necessary, claiming that all infection was destroyed in the process of milling, and that which escaped into the building did not survive the winter.

After due consideration of the statements made by the rice-millers, the members of the Board decided that, even though the process of milling would destroy the insects in the rice milled, a certain amount of infection would still remain with the sacks. The fact that the insects did not appear to survive the winter temperature of the mills did not prevent the infection being carried from the mills to the stores during the milder seasons of the year. Once the stores were infected, it was often very difficult to rid them of the infection.

There was therefore very good reason why every precaution should be taken to keep the rice-mills free from the objectionable insects imported with the products the mills handled. The Board had no wish to endorse any method of procedure that would work an unnecessary hardship on the millers, but would have to uphold the Inspector in using the proper discretion as to treatment of infected shipments imported.

An experimental concession was granted, allowing the rice-millers to mill certain infected rice direct from the wharf or a quarantined warehouse, and immediately send the empty sacks to the fumigating station. This avoids storing in the mill anything infected, and the method appears to work fairly well if carefully carried out.

EXPERIMENTAL FUMIGATION.

The several methods of fumigating infected products, warehouses, cars, and ships have become a very important undertaking of late years, in order to prevent as much as possible the enormous loss resulting from destructive insect pests and diseases.

During the last two years R. C. Treherne, Assistant Dominion Entomologist, has co-operated with your Inspector in a number of experiments. Hydrocyanic acid, carbon bisulphide, hot air, cold air, steam, and sulphur methods have each been given a trial, and some very good results obtained, details of which would be too long for this report.

It is hoped to obtain in the near future more valuable results from cold-storage experiments regarding rice-infection, which promise to greatly assist in solving the problem of dealing with that product in a satisfactory manner.

FUMIGATION BUILDINGS.

Owing to the necessity for economy, the erection of the new fumigation building at Victoria, for which an appropriation was made, was postponed.

The fumigation buildings at Vancouver were repaired by the Public Works Department to the extent of $200, putting them in fairly good working condition for the time being.

Nursery-stock Importations.

Very little nursery stock arrived from England or any part of Europe, most of the importations coming from the United States and some from Eastern Canada and Japan. There was a larger quantity of apple and pear trees from the United States and some increase in apricot and prune trees, also seedlings.

Stock Condemned.

The condemnation of apple, plum, and prune trees, blackberry stock and seedlings was not so heavy as the year previous; pear, cherry, grape, and ornamentals about the same, but more apricot, sweet chestnut, and raspberry.

There has been a vast improvement in the nursery stock from Japan, very little having to be condemned, for which the Yokohama Nursery Company deserve great credit.

Insects infecting Imported Nursery Stock.

The following insects were found infecting the several varieties of trees, shrubs, and plants during process of inspection at the fumigating station, Vancouver, and were condemned and destroyed accordingly:—

San Jose scale (*Aspidiotus perniciosus*): On apple, pear, plum, cherry, peach, apricot, chestnut, currant, and ornamental.
European scale (*Aspidiotus ostreæformis*): On apple, plum, cherry, and ornamental.
Oyster-shell scale (*Lepidosaphes ulmi*): On apple and ornamental.
Brown scale (*Lecanium*): On peach, apricot, plum, and ornamental.
Black scale (*Saissetia oleæ*): On ornamental.
Scale (*Aulacaspis rosæ*): On blackberry, raspberry, and ornamental.
Scale (*Chionaspis*): On blackberry, raspberry, and ornamental.
Cottony cushion-scale (*Icerya*): On grape-vine.
Cottony scale (*Pulvinaria*): On gooseberry, currant, and ornamental.
Greedy scale (*Aspidiotus rapax*): On ornamental.
Mealy bug (*Dactylopis destructor*): On plants.
Scale (*Diaspis*): On ornamental.
Woolly aphis (*Schizoneura lanigera*): On apple and seedlings.
Peach-root borer (*Sanninoidea exitiosa*): On peach, plum, and cherry.
Peach-twig borer (*Anarsia lineatella*): On apricot.
Raspberry-root borer (*Bembecia marginata*): On raspberry, blackberry, and rose.
Raspberry-cane borer (*Oberea bimaculata*): On raspberry and blackberry.
Blackberry gall-beetle (*Agrilus ruficollis*): On blackberry.
Blackberry gall-mite (*Diastrophus*): On blackberry.
Phylloxera: On grape-vine.
Fire-blight (*Bacillus amylovorus*): Infecting apple, pear, and quince.
Anthracnose, or bark-canker: Infecting apple, pear, cherry, plum, and ornamental.
Sour-sap: Affecting apple, pear, cherry, apricot, and ornamental trees.
Gummosis: Affecting cherry, plum, peach, and apricot trees.
Root or crown gall (*Pseudomonas tumefaciens*): On all varieties of standard fruit-trees and small-fruit bushes.
Chestnut-bark disease (*Diaporthe parasitica*): Affecting sweet chestnut.
Fungus root-rot: On grape-vines and ornamental trees.
Powdery mildew: On apple seedling, gooseberry, and grape-vine.

Imported Nursery Stock must come to Vancouver.

All nursery stock coming into British Columbia, or imported into Canada through a British Columbia port of entry, must be inspected and fumigated at Vancouver Fumigating Station, thus complying with both Dominion and Provincial regulations.

Your Inspector was also appointed a Dominion Inspector under the Dominion "Destructive Insect and Pest Act," and was responsible for the inspection and fumigation of all nursery stock imported into Canada through British Columbia.

AMENDMENT TO DOMINION REGULATIONS.

The Dominion regulations under the "Destructive Insect and Pest Act" were amended during 1917. Owing to the possibility of their carrying the disease known as "white-pine blister-rust," all varieties of currant and gooseberry (*Ribes* and *Grossularia*) are included with other varieties of stock that are prohibited entry into Canada.

FRUIT IMPORTATIONS.

The fact that fewer apples have been imported during 1917, and that a fairly good supply of British Columbia apples has been in evidence at Vancouver, is a good indication that this Province is continuing to make headway in supplying the local market from its own resources.

The importation of Japanese oranges was much less than in the year 1916 owing to the high freight and limited shipping accommodation. Grapefruit and tomatoes were also less. There was not much change in the quantity of plums and prunes, but an increase in crabs, pears, apricots, cherries, peaches, California oranges, and lemons; peaches and California oranges being the most conspicuous.

With the exception of apples and Japanese oranges, there was less fruit condemned than during the previous year.

The apples and pears were condemned for codling-moth principally, and a few for San Jose scale. Peaches, apricots, and plums were condemned for peach-twig borer (*Anarsia lineatella*) and brown-rot. Cherries were condemned for brown-rot. Lemons, oranges, and grapefruit were condemned for scale (*Aspidiotus aurantii, citricola, Chionaspis, Diaspis, Mytilaspis, Lecanium olea*) and brown-rot.

The condemned fruit was all shipped out of the Province, with the exception of a few small consignments that were cremated.

POTATO IMPORTATIONS.

Practically all the potatoes imported have been used by the evaporators, only a few very small shipments being for consumption within the Province. These have been imported from the following places during the year: China and Japan, 94 baskets, or about 3 tons; Florida (new potatoes), 143 hampers, or 4 tons 580 lb.; Washington, U.S., 11,592 sacks, or 651 tons 317 lb.; Alberta, Canada, 585 tons; Australia, 9,769 crates, 4,648 sacks, or 803 tons; total, 2,046 tons 897 lb.

The following potatoes from Australia must be deducted from the foregoing: Refused entry, 9,759 crates, or 500 tons; shrinkage from decay, 174 tons.

Besides the 9,759 crates of potatoes from Australia ex S.S. "Waitotara," which were refused entry for reason of their being infected with tuber-moth, another consignment of 4,648 sacks, or 304 tons, ex S.S. "Niagara," arrived at Vancouver on June 1st, 1917, from Australia for New Westminster evaporator.

Unfortunately this particular consignment of potatoes was all in sacks, and apparently very little thought had been given to ventilation. By the time they were unloaded it was evident that from 50 to 75 per cent. of the potatoes were so badly rotted as to be absolutely worthless. The result was that the refuse of what had been 174 tons of potatoes was loaded on a scow and towed out to sea.

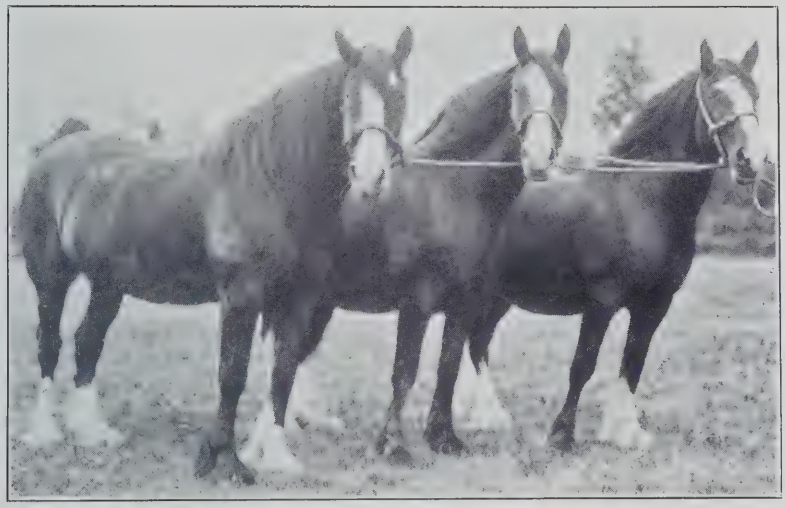
It would be a very poor business-man who would fail to take advantage of such a practical lesson, and not realize that the only sensible way to ship potatoes under such conditions would be in crates.

In conclusion, it may be well to state that this Branch has been self-supporting owing to inspection fees collected, the financial sheet for the year showing a good margin in favour of the Department.

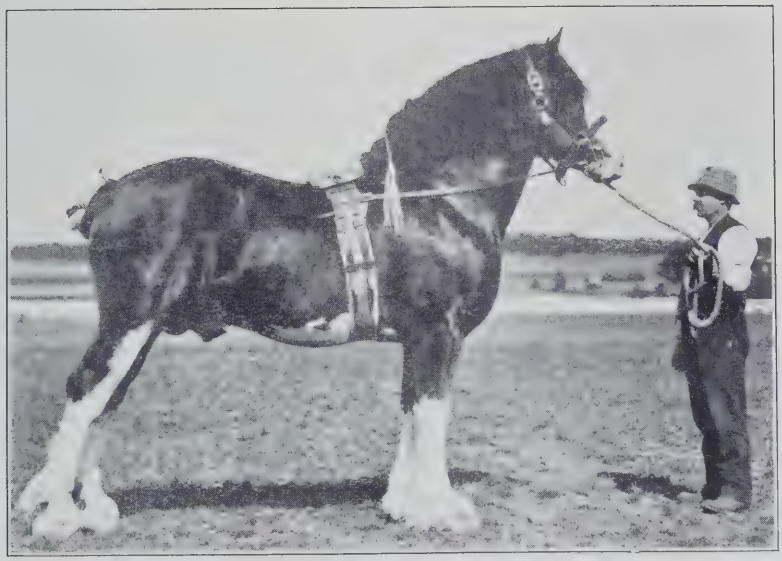
Respectfully submitted.

W. H. LYNE,
Inspector of Imported Fruit and Nursery Stock.

The pure-bred Ayrshire cow "Grandview Rose." 37030, six years old. This cow has established a record of 21,423 lb. of milk and 890 lb. of butter-fat.



Three Clyde mares.



"Baron's Craigie," Clydesdale raised at Westholme, Vancouver Island.

Homestead near Fraser Lake.

ANNUAL REPORT OF LIVE STOCK COMMISSIONER.

W. T. McDonald.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I have the honour to submit herewith my report of the Live Stock Branch for the year ending December 31st, 1917.

Conditions.

The abnormal conditions that have prevailed have fortunately not to any great extent at least disturbed the development of the live-stock industry, and, speaking generally, we can say that steady progress has been maintained. Immediately following the opening of the war the rapid advance in the price of grain and other feedstuffs was a disturbing factor, but now an adjustment has taken place which in some cases has meant a change in the methods of feeding, and there is now a general feeling among farmers and stockmen that production must be maintained at the highest possible point.

The labour problem has become a serious factor in determining the extent of the operations of our agriculturists, and in spite of earnest endeavours no satisfactory solution has been offered up to the present moment. Returned soldiers have helped out somewhat, but the number of these men who have taken up farming has been so limited that they have not as yet become a factor in solving the difficulty. Organized efforts are now being put forth to encourage the women to take up farm-work, and I confidently believe that women and girls will help to a marked degree on dairy and other farms, as they have already done in the fruit districts. Favourable reports have been received of the work done by women on the farms in Ontario and elsewhere.

During the year 1917 there has been a tendency in certain districts of the Province, and particularly on portions of Vancouver Island, to reduce the size of dairy herds owing to the price of feed and labour and the difficulty of securing labour at any price, but on the whole we expect a steady increase in the number of our dairy cows. Milking-machines have been installed on a large number of farms, and to a marked degree have helped to solve the labour problem.

Owing to a short hay-supply, with the experience of two severe winters fresh in their memories, some of the stockmen felt obliged to sell more than the usual number of cattle during the past fall, and in a few cases it has been learned that good young breeding cows were sold for slaughter. In most districts the beef cattle went into the winter in very good shape, this being especially true in the Chilcotin and Nicola. Satisfactory prices have prevailed, and throughout the year there have been many inquiries for breeding stock on the part of people who contemplated launching out in the cattle-raising business.

During the past season trouble was experienced in securing bulls for the beef-producing districts, and owing to the apparent shortage and keen demand, prices have been very high as compared with those of a few years ago. Bulls of the quality that could be purchased a short time ago for $100 have during the past year commanded prices ranging from $200 to $300 and even considerably higher.

Unfortunately the limited supply and high prices have had a tendency to encourage the use of some bulls of inferior quality, and so far as can be judged at the present time this condition will be no less acute during the coming year.

To a considerable extent spaying has been practised in the beef-producing districts, and it was generally rumoured that much more than the usual amount was being carried on during 1917. However, investigations showed that if there was any increase in the practice it was comparatively slight.

Owing to the high price of mutton and the extremely high price of wool, sheep production has had a very great incentive, and the numbers within the Province have been steadily increasing. A large part of the 1917 clip of wool was sold for about 60 cents per pound, and there is a firm belief that the price will be even higher during 1918. In addition to the Vancouver Island Flockmasters' Association, the Interior Wool-growers' Association was formed, with headquarters at Kamloops. These two associations have marketed wool co-operatively, and with very satisfactory results. To further improve market conditions for this commodity, the Federal Depart-

ment of Agriculture has established a national wool warehouse at Toronto, and it is anticipated that nearly all of the Canadian wool will be handled in a co-operative manner through this warehouse. It is proposed that the grading shall be done after the wool reaches Toronto. In the cases where wool is to be held for a more favourable market, a liberal advance will be paid to the grower at the time of shipment. As the market for wool is in Eastern Canada and the Eastern United States, it has been agreed that it would be a decided advantage to assemble the wool offered for sale at a point that can be conveniently reached by the buyers.

By Order in Council the Dominion Government removed the duty from breeding sheep imported into Canada for the duration of the war. As a result of this new regulation, many inquiries have been received from sheepmen in the United States who are planning to move their flocks into British Columbia.

In a few sections of the grazing areas a wood-tick has been giving trouble through the fact that it acts as host to a bacterial disease-producing paralysis in sheep, but it is hoped that by systematic dipping this trouble can be overcome.

In certain districts there is an abundance of timber or pine grass, which, though unsatisfactory for cattle, is excellent for the grazing of sheep, and we trust that in the near future flocks can be placed on these areas for the utilization of this feed which is now going to waste. In such cases the difficulty to be overcome in connection with such grazing operations is that of providing winter feed.

Horse-breeding has been at a rather low ebb during the past three years, but we now look for a steady improvement. The surplus of horses has been purchased by the Militia, and also for export to the Prairie Provinces. Towards the spring of 1918 we anticipate that there will be a local demand for horses at good prices. While the tractor has not been used to any great extent on British Columbia farms, we have reason to believe that a number will be purchased during 1918, but it will be some time before they will prove a serious factor in so far as the horse market is concerned.

VETERINARY DIVISION.

In addition to the regular staff of four Veterinary Inspectors, two temporary men were employed in April. The time of these men was devoted chiefly to the tuberculin-testing of cattle and inspection of dairies and stables under the "Contagious Diseases (Animals) Act." During the year, 15,598 head of cattle were tuberculin-tested. These cattle were kept on 1,889 different premises, and 579 reactors and 54 suspects were found. This shows approximately 3¾ per cent. of reactors among the number tested, and is very gratifying indeed when compared with the work of previous years. In addition to the reduced percentage, our Inspectors have found that to a large degree the tubercular lesions are not very extensive. This fact, together with the greatly reduced percentage, justifies the conclusion that the disease may be controlled and possibly entirely eradicated. After investigating the question from all standpoints, we have become firmly convinced that in order to obtain the most satisfactory results the work should be prosecuted in a most vigorous manner. It is highly important that all herds should be tested once a year, and those herds in which disease is found should be tested every three to six months until the disease is entirely eradicated. In this manner those animals which possess the disease in its incipient stages may be detected before the disease has become sufficiently far advanced to prove dangerous to other animals in the herd. The support of the dairymen and farmers to the tuberculin-testing of cattle has been very gratifying, and adds greatly to the efficiency of the work. The intradermal test still continues to give excellent satisfaction as a means of diagnosis.

Contagious abortion has given more or less trouble in our dairy districts, and is almost invariably accompanied or followed by more or less trouble from sterility.

A number of cases of trouble due to the eating of poisonous plants have been reported, but apparently there was less trouble from this source than during the previous year. A considerable number of cases of verminous bronchitis and one outbreak of influenza were handled by the Veterinary Division.

There is a noticeable tendency to improve the sanitary conditions of dairy and other barns, particularly in the older sections, while in many of the newer districts the settlers deserve great credit for the efforts they are putting forth to provide sanitary equipment for the housing of their live stock.

Elsewhere a report of Dr. A. Knight, Chief Veterinary Inspector, gives in full the work of the Veterinary Division.

Dairy Division.

In spite of a shortage of labour in many localities, the dairy industry of the Province has on the whole made satisfactory progress during the year 1917. In nearly all of the newer agricultural districts of the Province there is a tendency to follow dairy-farming, and in a number of places plans for the building of creameries are receiving consideration.

A new creamery has been established at Kamloops, and G. M. Longhout has developed a very creditable business in the manufacture of fancy cheese, and during the past year has opened a branch factory at Alberni. He repots a very keen demand for his product, and would be able to sell much more than he is manufacturing.

Prices for dairy products have been fairly satisfactory, and it is to be hoped that the granting of permission to manufacture and sell oleomargarine in Canada will not seriously interfere with the butter market. While there may be a place for this product during the period of the war, we are convinced that it is not a satisfactory substitue for butter, nor is it as healthful.

The "Dairies Regulation Act," which provides for Government supervision of the testing of milk and cream where the same is purchased on a butter-fat basis, gives every indication of proving very satisfactory. The chief benefit derived from this Act is due to the fact that it has inspired confidence, which is an advantage to both producer and purchaser.

The Cow-testing Associations continue to do excellent work, and have done more than any other one factor to place the producing end of the dairy industry on a business basis and give the farmer the opportunity of carrying on both breeding and feeding operations in an intelligent manner.

In the month of November the Holstein cow "Zarilda Clothilde III. DeKol," No. 14887, owned by the Colony Farm, completed the highest official world's record for milk production for any age or breed. She produced 30,467.3 lb. of milk in 365 days. "Grandview Rose," No. 37030, owned by Shannon Bros., of Cloverdale, made a new Canadian record for the breed by producing 21,423 lb. of milk and 890 lb. of butter-fat. These new records, added to many other records now held by dairy cows owned within the Province, furnish abundant proof of the natural advantages of the Province and of the progress being made by our breeders.

The British Columbia Dairymen's Association, of which T. A. F. Wiancko is Acting-Secretary, has had the most successful year in its history, and reflects the progress being made in the industry.

Mr. Wiancko's report gives in detail the work carried on by the Dairy Division.

Soil and Crop Division.

Co-operative demonstration stations have been carried on under the supervision of the Soil and Crop Division at the following points: Armstrong, Chilliwack, Edgewood, Grand Forks, Rock Creek, Rose Hill, Errington, and Pitt Meadows. Detailed reports of the work conducted on the various demonstration stations will be found in the report of the Soil and Crop Division, submitted by H. O. English and E. W. Hogan, as well as the results of other lines of work conducted by this Division.

Believing that the purpose of most of the demonstration stations had been achieved, it was decided by the Department to conclude the work at all of the above-mentioned points with the exception of Pitt Meadows. This has been the first year in which crops were grown on the Pitt Meadows plot. The results, however, were very striking, and clearly pointed out that much valuable information could be secured by a continuation of the work and a verification of the results of the past year. The value of an application of barnyard manure and lime was clearly demonstrated throughout the growing season and in the yields obtained.

Equipment for demonstration-work in underdrainage, clover and alfalfa hulling, and seed-cleaning is now in the possession of the Department for the use of the Soil and Crop Division. The seed-cleaning demonstrations have been especially satisfactory, and promise to achieve marked results in awakening farmers to the value of the use of good seed.

The field-crop competitions were conducted along similar lines to those followed in previous years, with the exception that the number of entries required in each competition was increased

from six to eight, while the total amount of prize-money paid in each competition was reduced from $45 to $30. A special prize, consisting of ten of the best agricultural periodicals, was awarded to the Farmers' Institute conducting the most successful competition, while a special machinery prize was offered where, in the opinion of the judges, a special prize was warranted. In connection with field-crop competitions, valuable information has been secured in regard to the cost of production of the various crops.

Seed fairs were conducted at the following points: Armstrong, New Westminster, and Duncan. Although this was the first seed fair held at Duncan, the exhibits were very creditable in both number and quality. These fairs should prove an important factor in educating our farmers along the line of seed selection and production.

Co-operative variety tests were conducted with the following crops: Wheat, oats, barley, corn, potatoes, flax, and sugar-beets. Altogether, 1,757 samples were distributed. The main purpose of this work is to determine the suitability of various varieties for the different districts in the Province.

POULTRY DIVISION.

Following the beginning of the war and the incidental advance in the price of grains, many of our poultrymen greatly reduced their breeding flocks, with the result that for a time the poultry industry of the Province appeared to be somewhat disorganized. Now, however, we find that the industry is again on a substantial basis, and our poultrymen are giving closer attention to the cost of production, and where practicable to do so are growing a large amount of the feed required. The price of eggs during the past year has been relatively high, but the advance has not been in proportion to the advance in the price of grain.

The poultry-shows have shown a splendid improvement in quality. The grouping of the various local Poultry Associations for the purpose of holding district shows instead of local shows has proven satisfactory. The Provincial Show and Convention of the British Columbia Poultry Association were held at Kamloops this year. It has now been decided to permanently locate the Provincial Show at Vancouver.

The International Egg-laying Contest still continues to be a most satisfactory feature of the work of the Poultry Division. A detailed report of the contest ending in 1917 will be found in the report by J. R. Terry, Chief Poultry Instructor.

The British Columbia Poultry Association, through its central organization and its locals, has been carrying on a good work in the interests of the poultry industry.

DISTRICT AGRICULTURISTS.

During the year two of our three District Agriculturists have resigned: J. H. McCulloch, of Kamloops, resigning on June 20th, 1917, and H. E. Walker, of Prince George, resigning on November 15th. On the resignation of Mr. McCulloch, George C. Hay, who had been stationed at Smithers, was transferred to Kamloops. These District Agriculturists have been doing good work as representatives of the Department of Agriculture, and are able to get in close personal touch with the farmers, thus forming a connecting-link and adding much to the efficiency of our work. Owing to the scarcity of suitable men we are finding it difficult to extend our organization along this line, but it is to be hoped that in the near future all agricultural districts of the Province will have a representative of our Department.

On April 1st, 1917, the two dry-farming stations, located respectively at 105-Mile House and Quilchena, were transferred to the Department of Agriculture and placed under the supervision of the District Agriculturist located at Kamloops. An effort is now being made to manage these farms along self-supporting lines, and a larger amount of stock is being carried on them than heretofore. From the time they were first operated much valuable information has been secured from the experiments conducted, and the yields obtained have been very satisfactory, and in some cases surprisingly heavy.

Prior to Mr. Walker's resignation he spent one month in making an inspection of the Peace River District. His report is very instructive indeed, and will be a valuable acquisition to the Department. The character of this report and the information it contains will abundantly justify the publication of it in pamphlet form. The thanks of the Department are due to Mr. Walker for the thorough and efficient manner in which he secured such information as he has presented in his interesting report.

Owing to the territory which the District Agriculturist is now endeavouring to serve from his office at Kamloops, the Department decided to purchase a Ford motor-car for his use. By this means he is able to cover a large territory in a more or less effective manner, and reports from various sources indicate that his services are very much appreciated throughout the district. (For further details *see* Mr. Hay's report.)

Silos.

In 1914 the Live Stock Branch inaugurated a campaign for increasing the number of silos. A very liberal estimate places the number of silos in the Province at that time at about fifty, while to-day there are approximately 525, and of this number the representatives of the Live Stock Branch have erected fifty-three. The campaign has now made such marked progress that we are confident there will be a great increase in the number of silos built during the year 1918 over that of any previous year, and we are convinced that within a comparatively short time nearly all of our dairy-farmers will be using silage. In addition to corn, a number of crops have been used for silage, among them being clover, alfalfa, oats, peas and oats, vetches and oats. The range of crops that can be used makes the silo practical for almost any district in the Province. In certain districts it is being made use of to store crops which are cut for hay during wet weather. Silage is not only valuable to provide succulent feed during winter months, but also to supplement pasture during the dry months of summer. We consider the campaign to popularize the use of silage as one of the most valuable lines of work conducted by the Department, and the results achieved have been, indeed, gratifying. (For further details *see* report of R. J. Ferris, Silo Demonstrator.)

Brands.

During the year 1917, 414 horse-brands and 583 cattle-brands were recorded. In the new "Brand Act" of 1917 provision was made for the licensing of all dealers in hides, and a large number of licences were granted. The stockmen of the Interior of the Province have been particularly desirous that Indians be required to record their brands. I am pleased to report that W. E. Ditchburn, Chief Inspector of Indian Agents for British Columbia, has been heartily in accord with this movement and has given every assistance. It is expected that, without making any change in Dominion legislation, the Indians, acting upon the advice of the various Agents, will have all brands recorded. At the present time nearly all the brands on some of the reservations have been recorded.

Boys' and Girls' Clubs.

During the year 1917, thirty clubs were organized, with a membership of 474. The following competitions were conducted: Poultry-raising, 23; pig-raising, 5; calf-raising, 1; potato-growing, 11. The results achieved by means of Boys' and Girls' Clubs have been very gratifying, and we consider the value of this work second to no other line of agricultural education. Not only does it stimulate to a very marked degree an interest in agriculture on the part of the boys and girls, but, in addition, through these competitions the adults usually become interested as they would by no other means.

Owing to the urgent demand of other duties, it is impossible for your Commissioner to devote the personal attention to this work which its importance justifies.

British Columbia Stock-breeders' Association.

The Stock-breeders' Association held a most successful convention in Victoria during the past year, and its members are keenly alive to the various problems brought about by the war. At all times the association has shown an earnest desire to support the Live Stock Branch in its efforts to bring about better conditions and to promote a campaign for more and better live stock.

Five delegates from this association attended the annual convention of the Western Canada Live Stock Union, which was held in Regina, and where many important matters of vital interest to the live-stock industry and to agriculture in general were considered and dealt with. While originally formed for the purpose of securing more equitable representation for the West in the Dominion associations, the objects of the Western Canada Live Stock Union have been extended to include all problems that have to do with the betterment of agricultural conditions, and it has

been able to give valuable assistance to both Federal and Provincial Governments in advising on matters of legislation. It has also been successful in securing more favourable transportation rates and facilities.

BRITISH COLUMBIA GOAT-BREEDERS' ASSOCIATION.

During the past year there has been organized a British Columbia Goat-breeders' Association, of which George Pilmer, Secretary of the Live Stock Branch, has been elected Secretary-Treasurer. Owing to an increasing interest being taken in goat-breeding, particularly in regard to milch goats, it was deemed advisable to organize for the purpose of harmonizing all interests concerned and for mutual encouragement and benefit. The members now number 176, and at the Vancouver Exhibition in August, 1917, a most creditable exhibit of milch goats was held under the auspices of the Provincial Association.

As a result of the Provincial organization, the British Columbia goat-breeders have been successful in securing the organization of the Canadian Goat Society, which has made arrangements for the recording of pedigrees, and has secured the recognition of the National Records Board. This achievement on the part of the British Columbia breeders will place the goat industry throughout Canada on a firm basis. Mr. Pilmer is Secretary of the Canadian Society.

FARMERS' INSTITUTES.

The various members of the Live Stock Branch have assisted in Farmers' Institute meetings throughout the Province, and also in judging at fall fairs.

Respectfully submitted.

W. T. McDONALD,
Live Stock Commissioner.

ANNUAL REPORT OF DAIRY INSTRUCTOR AND INSPECTOR.

T. A. F. WIANCKO.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

SIR,—I beg to submit herewith my report as Dairy Instructor and Inspector for the year 1917.

DAIRY INDUSTRY.

The dairy industry may be said to have been in a fairly healthy condition during 1917, and when full reports are to hand it is expected that a small increase in total dairy production will be noted.

Weather conditions were not always favourable to dairying. The winter season was one of unusual severity, and thus, coupled with high-priced grain and mill feeds and an inferior quality of hay owing to wet weather during the hay harvest of 1916, had a measurable effect in decreasing the winter milk-flow. Spring opened up later than usual, further depleting the winter feed-supply and also occasioning late spring pasture. This was, however, greatly offset by good growing weather in May and June, resulting in abundant forage until well on into the summer. Dry weather during August and September was rather severe on the dairyman who through lack of foresight failed to provide supplementary feeds. A fine, mild, and open autumn helped out considerably in lengthening the period of heavy milk-flow, and resulted in a great saving of winter feeds for the present winter season.

The labour problem has been one of the most perplexing that has ever confronted the dairyman. Owing to heavy enlistment from the agricultural population, the securing of satisfactory help on the farms has been most difficult and in many cases impossible. Mechanical milkers have come to the assistance of many of the more prominent dairymen, and many of them declare that without them they would be obliged to largely curtail their dairy operations.

PRICES FOR DAIRY PRODUCTS.

Butter prices have been higher the past season than ever before reached in Canada, resulting in reasonable returns to cream-producers, notwithstanding high prices of feed and labour.

Prices for British Columbia Cheddar cheese also have been very satisfactory, ranging from 23 to 26 cents wholesale. At these figures it has been found profitable to make cheese in competition with cream prices in some districts.

Milk prices on the whole were more satisfactory during the past year than in 1916. This is especially true on the Lower Mainland, where, owing to proper organization in a co-operative way, the producers held the prices at a point that ensured a reasonable profit over actual cost of production.

Creameries.

The regular inspection of creameries has received as much attention as time would allow, and the majority of them were visited at least twice during the year. Continued improvement in the quality of British Columbia creamery butter has been noted. Makers are showing a more intelligent interest in their work and a desire to improve. Several creameries have installed improved pasteurizing apparatus during the past season, and several others have commenced a system of cream-grading. With intelligent grading and pasteurization, there is no reason to fear competition from the finest grades of imported butter. Sanitary conditions at the creameries were found to be quite satisfactory.

During the year a new creamery has been established at Kamloops. The Abbotsford Creamery has been closed, and the Clayburn Creamery has been opened up in the old stand of the Meadowbrook Creamery, consequent upon the removal of the latter to Vancouver early in the year.

Many inquiries have, as in former years, been received relative to the opening-up of new creameries in new districts. This indicates that the number of dairy cows is increasing in the newer districts, and that settlers regard dairying as one of the safest methods of getting a start on the land. In a number of cases your Instructor, after careful inquiry, has recommended that the matter be left over for a year at least, in order that a sufficient number of cows be available to make the venture a success from the start, bearing in mind that a premature creamery has so often been the cause of a serious set-back in such districts. It is much better to postpone action in such cases for a year or so and encourage the shipment of cream to existing creameries even at great distance. Your Instructor is convinced that the policy of more or less centralizing the business is the only one suitable for a large portion of the Province at the present time. Patrons then have the advantage of a larger output of butter of a uniform quality, thus reducing the cost of manufacturing and correspondingly decreasing the chance of failure.

A list of the active creameries and condenseries of the Province is given in Appendix No. 8; also a summary of creamery report for the year 1917 in Appendix No. 9.

Cheese-making.

During the year the Ferrara Cheese Company, Limited, established a factory for the manufacture of fancy cheese at Chilliwack. The Dominion Experimental Farm at Agassiz has continued to make up a large part of the milk produced on the farm into Stilton, cream, and other fancy cheese. G. M. Langhout, of Colquitz, manufactures a very fine quality of Gouda, Swiss, and other fancy cheese, amounting to about 1 ton per month. Besides these, quite a number of private dairies make small quantities of cream and cottage cheese, which finds a very ready sale. Since importation of fancy cheese has been very largely curtailed by reason of the war, there is a great demand for that of local manufacture, and it would be to the advantage of our dairymen to further increase the supply.

Cheddar or Canadian cheese has also received some attention in a small way. The creamery at Revelstoke has manufactured a few thousand pounds. The Fraser Valley Milk Producers' Association have turned a considerable quantity of this surplus milk into cheese during the flush season.

City Dairies.

Owing to other duties, not quite as much time was allowed for the inspection of city dairies and milk-vending establishments as formerly. Generally speaking, these are in a fairly good sanitary condition, and continue to show improvement in the way of new and up-to-date equipment and facilities for rapid handling.

At the present time the Vancouver City dairies are considering the advisability of amalgamating or combining in order to improve the distributing end of their business. Great waste

of time, energy, and money has taken place for years past, due to the multiplication and duplication of milk routes and excessive costs in handling. It is felt that a very material saving can be effected by a proper organization of the business under one or two heads, resulting in the reduction of the price of milk to the consumer, as well as allowing a fair margin of profit to the producer.

COW-TESTING ASSOCIATIONS.

The Cow-testing Associations at Chilliwack, Langley-Surrey, Delta, and Comox have had a satisfactory year, and at each centre a number of farmers are awaiting a chance to become patrons should there become any vacancies. This in itself is an indication of the hearty way in which the work is being appreciated. Great difficulty has been experienced in securing efficient testers, or Supervisors, owing to the general scarcity of help and high prices being paid for ordinary labour. At the present time three out of the four Supervisors are returned soldiers, and the fourth is a man who is unfit for military service. All are rendering satisfactory service.

This work could be largely extended and increased if suitably trained men were available as Supervisors, and at this time there is an opportunity for the training of returned soldiers for the work.

Referring to the work of the Cow-testing Associations in British Columbia, in an address before the Annual Convention of the British Columbia Dairymen's Association at Nanaimo in January, 1917, Geo. H. Barr, Chief Dairy Division, Department of Agriculture, Ottawa, said: "I think this Province is doing better work than any other Province in Canada in cow-testing. I think that at the present time the method followed here is the simplest and cheapest that will get the largest number of men interested in the work."

The British Columbia Dairymen's Association have for the past three years given prizes for the greatest production of butter-fat by individual cows in the several associations. Three prizes (first, $10; second, $6; third, $4) were given in each of two classes for each association. Appendix No. 6 gives the records of the prize-winners, and indicates very forcibly the productiveness of some of our grade dairy cows.

OFFICIAL TESTS.

Testers are still being supplied for Holstein Advanced Registry tests, and during the past years such tests have been carried on at the Colony Farm, Essondale; Experimental Farm, Agassiz; and the farms of Dr. S. F. Tolmie, Victoria, and J. M. Steves, Steveston.

Two noteworthy official records during the year are those of cows owned by the Colony Farm, Essondale, as shown in Appendix No. 7.

CANADIAN NATIONAL RECORD OF PERFORMANCE.

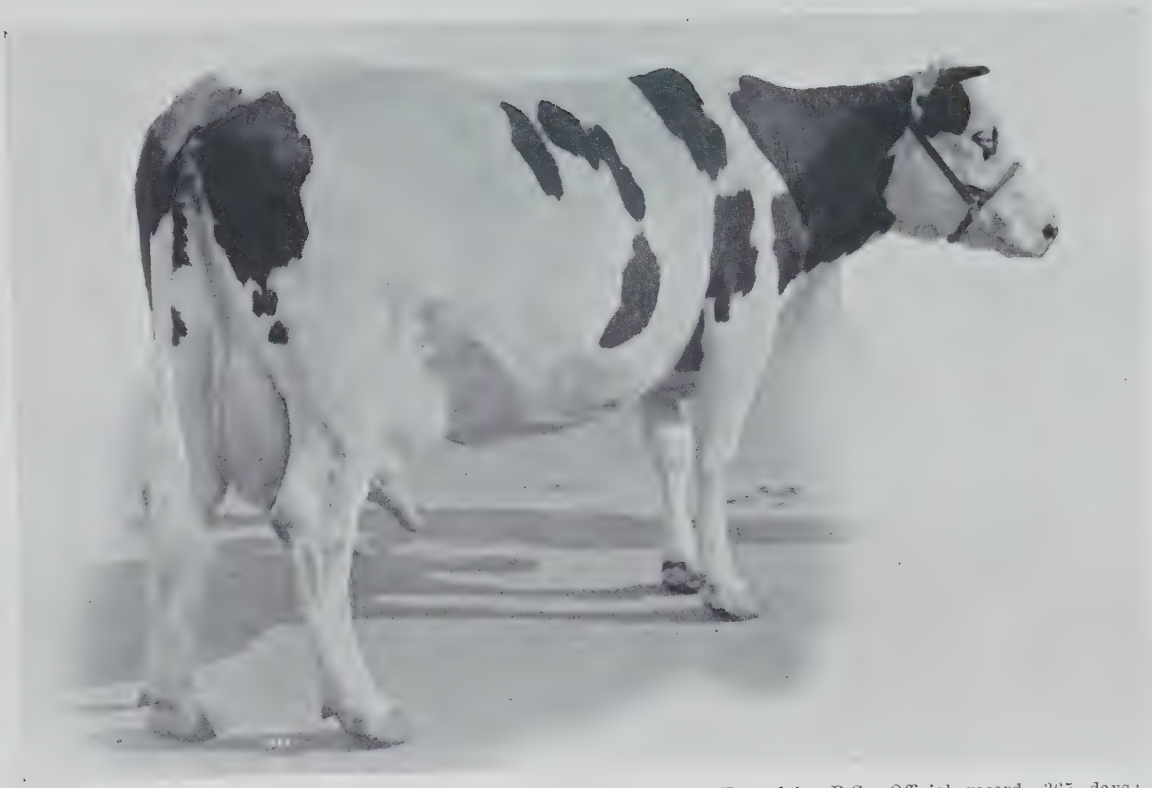
The value of this national record for pure-bred stock, conducted by the Dominion Live Stock Branch, continues to be recognized by British Columbia breeders. About fifty-six dairymen have had cows entered during 1917, as against forty-four and thirty-five in the years 1916 and 1915 respectively.

One of the notable cows entered in this test for the past year is "Grandview Rose," No. 37030, whose C.N.R.P. test gave 21,423 lb. milk and 890 lb. fat, but went ten days over the fifteen months' freshening period, therefore failing to qualify. She is the first Ayrshire cow in Canada to produce over 20,000 lb. of milk in one year, and is second high cow in the C.N.R.P. over all breeds in Canada. She gave birth following test to twin calves, a bull and a heifer. She was bred and is owned by Shannon Bros., Cloverdale.

"DAIRIES REGULATION ACT."

Rules and regulations governing the "Dairies Regulation Act" (chapter 16, 1916) were passed by Order in Council in March, 1917, and became operative upon publication in the British Columbia Gazette during August last. This law makes it necessary that each and every creamery, dairy, or milk-handling plant of any kind accepting and dealing in or paying for milk or cream on the basis of the percentage of butter-fat contained therein to be licensed, and to have in its employ a properly qualified licensed milk-tester.

Up to the present time fifty-four applications for testers' licences have been received. Of these, thirty-six candidates have been examined and have obtained licences. The examination in each case consisted of a practical examination in testing by the Babcock method, followed



"Zarilda Clothilde 3rd DeKol," No. 14887, owned by Colony Farm, Essondale, B.C. Official record, 365 days: Milk, 30,469.2 lb.; butter-fat, 857.30 lb.; butter, 1,071.6 lb.

Part of Southern Okanagan Fruit and Vegetable Experimental Station, Summerland, B.C.

Pruning-school in Kootenays, 1917.

Netted Gem potatoes grown in bottom land; yield, 12 tons per acre.

by a written examination consisting of a series of questions on the composition, sampling, and testing of milk and cream. (Specimen examination paper is shown in Appendix No. 10.) One candidate failed in the first examination and will be given another chance within a few weeks. Further examinations will be held for the balance of the applicants as time permits.

Creamery and dairy licences will date from January 1st each year. Applications for 1918 are now being received, and licences will be issued in due course.

The following is a list of licensed testers up to date:—

Milk-testers licensed under "Dairies Regulation Act."

Name.	Address.
Batey, Herbert S.	Armstrong.
Boughtwood, Geo.	Valley Dairy, Ltd., Vancouver.
Bubar, D. T.	Courtenay.
Bunting, Thos.	Heffley Creek.
Burmeister, J.	Oxford Dairy, New Westminster.
Carman, J. E.	Revelstoke.
Campbell, A. M.	Fraser Valley Dairy, Vancouver.
Carter, J. N.	Turner's Dairy, Vancouver.
Carroll, W. J.	Courtenay.
Clark, F. J.	850 Fourteenth Ave. East, Vancouver.
Cranswick, P.	Royal Dairy, Vancouver.
Dudman, Alfred	Meadowbrook Creamery, Vancouver.
Dunn, J. S.	Nanaimo.
George, H. H. S.	Kamloops.
Gillman, R. H.	Northwestern Creamery, Victoria.
Hall, F. D. B.	Chilliwack.
James, David A.	Standard Milk Co., Vancouver.
Jenne, R. Everett	Grand Forks.
Johnson, Alfred	Salmon Arm.
Karnagel, R.	Salmon Arm.
Kell, Geo.	New Westminster.
Lewarne, A. E.	City Dairy, Vancouver.
Livingstone, J. M.	Vancouver Creamery, Vancouver.
MacKenzie, H. H.	New Westminster.
MacLeod, W. K.	Chilliwack.
Magar, J. A.	Kamloops.
Matheson, D. W.	Spencer's Creamery, Vancouver.
Rive, E.	1170 Hornby Street, Vancouver.
Sellers, Jas. H.	City Dairy, Vancouver.
Silver, M. R.	c/o P. Burns, Ltd., Vancouver.
Smith, Geo. W.	Nelson.
Smith, W. S.	Spencer's Creamery, Vancouver.
Thomas, S. J.	Kelowna.
Turner, L. H.	Turner's Dairy, Vancouver.
Washington, F. J.	Fraser Valley Dairy, Vancouver.
Watson, J. B.	Sardis.

Official Milk-testers.

The appointment of official testers in places where there is sufficient business to warrant it has been provided for under the rules governing the "Dairies Regulation Act." In May last Elias Rive and J. B. Watson were appointed such official testers at the request of the dairymen of the Lower Mainland. These men are under the direct supervision of this Department, and their duties consist of determining butter-fat tests of milk and cream, checking up weights and tests, etc., for both producers and purchasers. Very valuable service has been rendered by them, in that they have established a bond of confidence and closer co-operation between producer and purchaser.

DAIRY DEMONSTRATIONS AND LECTURES ON DAIRY SUBJECTS, 1917.

Covering a period from February 17th to March 20th, assistance was given to the usual Farmers' Institute meetings. Twenty-one institutes were addressed on subjects of general interest to dairymen, and in a number of instances practical demonstrations in butter-making were given. At the Summerland short course an address was given on the "Care of Milk and Cream," followed by a butter-making demonstration. At the latter meeting over ninety persons were present. A full report of the several meetings addressed has been submitted to the Secretary of the Department. At other times during the year special addresses in connection with Cow-testing Associations, British Columbia Dairymen's Association, Summer School for Teachers, Women's Institutes, and organization of new creameries were delivered.

FALL FAIRS.

During the season of fall fairs assistance was given in the judging of dairy products. The following fairs were included in the itinerary: Nanaimo, Parksville, Vancouver, Armstrong, Kamloops, and Saanich. A report on these has also been submitted to the Department.

BRITISH COLUMBIA DAIRYMEN'S ASSOCIATION.

The British Columbia Dairymen's Association has enjoyed one of its most successful years during 1917. The membership roll for 1917 stands at 277, representing an increase of fifty-seven over the previous year.

The annual convention of the association was held in Nanaimo on January 25th and 26th. The policy of the association of holding its conventions in the different dairying districts in turn has been fully justified, as the nearer these conventions can be brought to the dairymen, the better they will be attended, and the better the purposes for which the association exists will be promoted.

At the earnest request of the dairymen of the Okanagan Valley an extra convention of the association was held in Kelowna on June 22nd and 23rd. At that time demonstrations in live-stock judging and field-crop demonstrations were made special features of the meetings. These, together with addresses on dairy subjects by our most prominent agriculturists, rounded out by several picnic lunches and motor trips through the surrounding district, resulted in a most instructive and happy time to all who attended.

The eleventh annual report of the association was prepared and published. This includes a full statement of the affairs of the association, and is supplied free to all its members.

OFFICE-WORK.

This branch of the work has continued to increase. The letters received and replies sent out have never been so numerous, as evidenced by the following comparative statement:—

Letters received—	
1914	977
1915	814
1916	767
1917	923
Letters dispatched—	
1914	936
1915	1,152
1916	1,175
1917	1,303

Respectfully submitted.

T. A. F. WIANCKO,
Dairy Instructor and Inspector.

"Janet," No. 18057. Age, 4 years 85 days. Yearly record: Milk, 23,004 lb.; butter-fat, 717 lb. Owned by Dr. S. F. Tolmie, Victoria, B.C.

Up-to-date dairy-barn, Crescent Valley, B.C.

Young Yorkshire sows. They show quality and uniformity.

"Crystal May," 420, milked 4½ quarts to 5 quarts per day within sixty days of dropping her first kids.

Angora goats.

Good land-clearers.

ANNUAL REPORT OF POULTRY INSTRUCTOR.

J. R. Terry.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit herewith my annual report of the work of the Poultry Division for the year 1917.

General Conditions.

During the year just concluded the industry has continued to experience the same unfavourable conditions that have been present practically since August, 1914. Feedstuffs have greatly increased in price as compared with the year previous. To partly offset this, the prices received for eggs, dressed fowls, and breeding stock have been higher, fortunately.

The climatic conditions could hardly have been worse during the spring months—the natural period of incubation. Bitter cold winds, snow, sleet, and rain were quite general in March and early April. From then on the season still continued cold and backward. There were numerous complaints of poor hatching results in consequence. In some cases the hatching season was delayed almost two months. As a result pullets were slow in developing, thus missing the good prices being paid for eggs in the fall and early winter.

Owing to the scarcity of fresh eggs in the spring the prices obtained were higher than usual, and continued a few cents above the 1916 average.

A peculiar condition was brought about in midsummer through the general public continuing to purchase eggs for packing, even when the price asked was almost 100 per cent. higher than usual. Fearing a big shortage during the winter, the public commenced packing early in April and continued right through May and June. It is computed that the quantity of eggs packed by householders was more than threefold that of previous years.

The number of chicks hatched was somewhat smaller than in 1916, but the increased prices received would bring the estimated total value well up to that of other years.

The well-established breeders have not reduced flocks to any extent, but in most cases have arranged so that their laying flocks contain a larger percentage of pullets than usual. Yearlings have been marketed since July last.

Where feed was purchased in large quantities in the spring of 1917 the poultry-keepers have been satisfied with the year's turnover.

The Prairie Provinces continue to purchase both eggs and breeding stock from our breeders as in previous years. It may be interesting to note that the Dominion farms in the Province now supply the poultry-breeding stock to practically all of the other experimental farms in the East. The egg records made, notably at the Experimental Farm, Sidney, on Vancouver Island, far exceeds all other records made elsewhere at similar farms in the Dominion.

Eggs and stock were again exported to the Antipodes, Japan, China, and to the United States. The number of day-old chicks, especially, going to the United States was in excess of all other years.

The city markets throughout the Province have again proved of value in providing means whereby local produce could be profitably marketed.

Rabbit-breeding.

This industry has again made rapid strides, due, no doubt, to the high prices received. The city markets have again done much to popularize rabbit-meat as an article of food. A large quantity of commercial rabbit-meat is now being canned, particularly in the Interior, where markets are not so easily secured as at the Coast. The prices received for some kinds of rabbit-furs are still high enough to make it worth while saving the skins. Pure black furs are most in demand. An association of breeders is now in course of formation.

Lectures and Demonstrations.

During the year, particularly the spring and summer months, the members of this Division spoke and demonstrated before members of Farmers' Institutes during the regular itineraries given, and also at supplementary meetings.

The summer school for teachers was again resumed, and this Division lectured and demonstrated to those taking the rural-science course. In addition, trips were arranged to local farmers; proceedings much appreciated by the students. Mr. Upton, Assistant Instructor, again spoke to the first-year class, which was, as usual, larger than the second-year one.

Lectures and demonstrations were also delivered before members of local Poultry Associations throughout the Province, whilst in each locality the speaker endeavoured to visit as many poultry-breeders as possible.

Fall Fairs.

The members of this Division, assisted, as in former years, by competent Provincial judges, placed the awards on poultry exhibits at the fall fairs and exhibitions. Whilst there was a slight falling-off in the number of exhibits, the majority of specimens shown were well up to former years in quality.

It is a pleasure to again report that accommodation for the poultry exhibits has improved. Undoubtedly this is due in a large measure to the fact that where poultry-breeders are elected to the show committees, more attention has been given to this matter.

The breeds most largely shown in other years again held popular fancy during the year. Plymouth Rocks, Wyandottes, Orpingtons, and Rhode Island Reds were the favourites in the general-purpose class, and Leghorns, Minorcas, and Anaconas in the egg-producing class. The Leghorns (White variety) are probably the most numerous breed in the Province, with the Wyandottes (White) a close second. The number of fairs giving classes for single entry is increasing.

Egg exhibits were more numerous than usual, and some very creditable displays were made. Several fairs still offer prizes for the largest eggs, regardless of freshness or otherwise of exhibits.

Provincial Poultry Association.

In 1917 the association, despite continued enlistment of farmers keeping poultry, was again able to show a total membership as large as the previous year. A decrease in the number of affiliated associations has to be recorded, however. Four associations dropped out, and one new association (New Denver) was affiliated during the year, making a total of thirty local societies now in being. A majority of the associations engaged, as before, in the co-operative purchasing of feedstuffs, which very materially benefited its members.

The association again published its directory of breeders. The same number of copies were printed as usual, and distributed throughout the Province and also on the Prairies. The date of publication was a little earlier than heretofore, thus affording intending purchasers of eggs or stock plenty of time before the hatching period took place. The directory has proved of inestimable value, both to purchasers and vendors of poultry.

The district grouping of poultry-shows has proved a very satisfactory move, and has been the means of enabling those concerned in operating such shows successfully, especially from a financial standpoint. The districts now consist of ten groups, included in which is the Provincial Show.

The Provincial Show has now been located permanently at Vancouver, where it is confidently expected that it will again become the largest show held west of Guelph, Ontario.

The annual convention was recently held in Kamloops, and proved a great success. Nearly all the local associations were represented by their delegates. The show was held at the same time and place. It was pre-eminently a show of quality, and in numbers of exhibits was equal to the previous one. For the first time, this show has been operated without loss. A lady was elected Secretary for the first time, which showed the good judgment of the Executive by the successful manner in which the event was handled.

The association again donated prizes of $5 each to its members competing in the egg-laying contest whose pens laid at least 175 eggs per bird during the year. Diplomas were also awarded monthly.

Members of the association also did remarkably well in the Egg-laying Contest held at the Washington State College, Pullman. As a result an excellent export trade was worked up in stock and eggs during the year.

Your Instructor was again appointed Secretary-Treasurer and Mr. Upton Assistant Secretary, as per requirements of the constitution. (For list of the affiliated associations *see* Appendix No. 12.)

British Columbia Show Groups.

(As revised, August, 1917.)

	Percentages.
District No. 1.—Vancouver Island, from Duncan north and including Duncan, Comox, Parksville, and Nanaimo	7
District No. 2—Vancouver Island, from Duncan south and including Victoria, Saltspring Island, Sooke, Langford, and Cobble Hill	10
District No. 3.—Vancouver City, includes the territory west of the eastern boundary of Burnaby; includes Vancouver City, North Vancouver, Central Park, and Point Grey	12
District No. 4.—From North Bend south and west to the eastern boundary of Burnaby, including Maple Ridge, Mission, and Chilliwack	9
District No. 5.—From North Bend north and east to Sicamous Junction, including Ashcroft, Kamloops, and Salmon Arm	25
District No. 6.—From Sicamous Junction south through the Okanagan Valley to Vernon, including Northern Okanagan	7
District No. 6a.—Kelowna, south to International Boundary, including Kelowna, Summerland, and Penticton	7
District No. 7.—From Sicamous Junction east to Alberta on the main line of the C.P.R. and south from Revelstoke to Slocan, including Revelstoke, Golden, Arrowhead, and Nakusp	7
District No. 8.—From Kootenay Lake west to Okanagan Valley, excepting that part included in District 7, including Nelson, Trail, Grand Forks, and Greenwood (Provincial Show)	9
District No. 9.—Crowsnest Valley, from Kootenay Lake east to Alberta, south of the main line of the C.P.R., including Fernie and Cranbrook	7
Total	100

Egg-laying Contest.

The Sixth Egg-laying Contest ended in October 5th, 1917, running the full year. The pens were filled as follows: Class 1, 21 pens; Class 2, 19 pens. With one exception, all the pens were Canadian-bred. One pen was entered from Oregon, U.S.A., and one pen came from Ontario. In the first class all prizes were won by White Leghorns, and in Class 2 the prizes were won as follows: First, second, fourth, White Wyandottes; third, Rhode Island Whites; fifth and sixth, Rhode Island Reds.

Additional special prizes, in the form of silver and bronze medals, were kindly donated by well-wishers.

The weather conditions were certainly not an improvement on the year previous. Throughout the spring and early summer the abnormally cold weather kept down egg production very materially.

The fowls that were not needed by contestants at the conclusion were sold by auction in Victoria. The final report of the contest, together with summary of same is shown in Appendices Nos. 11 and 11a.

"Eggs Marks Act," Inspection.

In addition to the members of this Division and the Coast Markets Commissioner in Vancouver who were originally appointed Inspectors to enforce the above Act, amendments were passed at the last session of the Legislature appointing all Provincial and municipal police officers and Health Officers to be Inspectors also. In addition, the poultryman in charge of the Egg-laying Contest was also appointed Inspector.

Infractions against the Act were very few during the first half of the year, but towards the period of egg shortage—October and November—so many complaints were made that charges were laid both in Vancouver and Victoria. In the majority of cases convictions were made.

It has been found necessary to suggest further amendments to the Act, owing to the fact that in several cases Inspectors were unable to secure convictions on account of the Act lacking comprehensiveness. As it was, a great improvement is to be noted in regard to the sale of eggs as compared with the period before the Act was in being.

During the year the Inspectors paid regular visits to all city markets on the Coast, besides making numerous calls on dealers, producers, and cold-storage plants.

BOYS' AND GIRLS' COMPETITIONS.

The past season was the second in which these competitions have been held, and great strides have been made. No less than twenty-four clubs were organized, as compared with eight the previous year. An earlier start was made in 1917, thus affording the children a better chance of success.

Considering the differences in climatic conditions, the results achieved by members of the clubs have been very creditable indeed. For instance, owing to the very late season in the Fort George District, the chicks were not hatched till weeks later than other districts, and yet the young stock showed signs of maturing well when visited in early fall. The largest club was that organized at Nelson, with forty-five competitors.

Complaints were numerous from almost every club regarding the depredations of birds of prey, coyotes, cats, mice, etc. The hawks and owls were especially bad during the fall months. It is to be hoped that the bounty about to be placed on owls will have an immediate effect.

Where possible, the flocks were visited twice by the judge and scored, while with the others the two scorings were made during the fall visit. An encouraging feature is the evident improvement in the general flocks kept by parents of contestants as compared with last year. The children have also sold a goodly number of breeding males from their flocks of both 1917 and 1916. In writing the essay required from each club member, a large majority of the children show that they fully realize the importance of attention to detail as essential to success. A list of clubs, etc., follows:—

Boys' and Girls' Clubs—Competition Entries in Poultry.

Name of Club.	No. of Competitors.	Name of Secretary.	Address of Secretary.
Arrow Lakes	22	Miss L. Parkinson	Nakusp.
Beresford	10	Miss Theresa Furiak	Kamloops.
Castledale	8	Miss Owen Gilbert	Castledale.
Courtenay	13	Harold Leighton	Courtenay.
Cowichan	12	E. H. Sherman	Box 483, Duncan.
Denman Island	9	Alex. Chalmers	Denman Island.
Fruitvale	12	Edward Garrard	Fruitvale.
Fort George	12	Charles F. Daly	Fort George.
Kelowna	9	T. M. C. Tayolr	Kelowna.
Martin's Prairie	9	Miss Martha Uvila	Pritchard.
North Kamloops	13	Chas. McC. Mottley	Box 202, Kamloops
Naramata	11	Miss Catherine Hancock	Naramata.
Nelson	46	Jack Fraser	Nelson.
Needles	8	Miss Erna Spiller	Fauquier.
Robson	10	Miss Margaret Brown	Robson.
Sooke and Milne's Landing	10	Miss Margaret Dewar	Sooke.
Scarf and Otter Point	11	Miss Margaret Woolsey	Scarf.
Salmon Arm	12	G. Reynolds	Salmon Arm.
Tappen	13	Miss Edna Brooke	Tappen.
Wapta	11	F. W. Ball	Parson P.O.
White Wyandotte, Castlegar	11	Miss Rose E. Watts	Castlegar.
West Summerland	12	Ronald Phinney	West Summerland
Mission City, Wyandottes	9	....	....
Mission City, Rocks	8	....	....

INSTRUCTIONS TO RETURNED WOUNDED SOLDIERS.

This Division has during the year visited returned soldiers who have engaged in poultry fancy either as a side-line or main occupation. The Convalescent Home at Esquimalt, where

both poultry and rabbits are kept, was also visited and helpful discussions taken part in. The poultry plant at the Sanatorium at Tranquille has been in charge of the sick soldiers there, to whom bulletins have been supplied. Special prizes were awarded their exhibits at the recent Provincial Show at Kamloops.

Dincontinuance of Breeding-stations.

No stations were operated during the year, although it is hoped that the Department may see fit to again locate breeding-pens in the least accessible parts of the Province, as formerly.

Publications.

The demand for bulletins has been as great as in former years, and as a consequence several reprints have been made. A bulletin dealing with the selection of breeding stock and a circular bulletin treating of chicken-pox were issued during the year.

Regular monthly reports of the Egg-laying Contest were issued, and articles on poultry subjects were supplied by members of this Division to the columns of the poultry periodicals, the *Agricultural Journal*, and Provincial press.

Inspection and Instruction Work.

Every opportunity has been taken by this Division to visit poultry-farmers and others interested. The parties visited have always showed a willingness to accept advice and help.

Poultry-diseases.

The cold spring and early summer again made conditions extremely favourable for the development of colds and allied diseases. Epidemics of diphtheritic roup have continued to break out in various parts. The investigational work in connection with this disease has been continued. Favourable results have been obtained by means of vaccination.

Mr. Upton, who carried out this work, which has entailed much labour and care, reports as follows:—

". . . The cases of diphtheritic roup and chicken-pox, however, are being continually brought to our attention; many, however, in the embryonic stages, where a little care and attention has served to hold this trouble in check. We can say, however, that this disease has been checked to a great extent on Vancouver Island, where it was mostly prevalent in 1915, 1916, and 1917. During the past twelve months we have injected some 2,091 birds. Each bird was given the usual two inoculations with the vaccine which was prepared by ourselves. Very good results cannot be reported from the vaccine used, and the owners of the flocks injected were desirous of having the 1917 hatched stock injected also. This could only be done in cases where necessary, owing to the scarcity of material for making vaccine. At this time we can report excellent results from 591 birds out of 831 injected since September, 1917; not one instance of this disease having shown itself in any of the 591 birds. One lot of 240 birds, representative of some forty flocks, were injected, and the results were not as good, the vaccine used seeming to take a longer time to cause immunization in the stock than in the other 591 birds representing three other flocks. The same vaccine was used in all the birds, however. From these results it is again felt that we can produce even more evidence to prove the first statement, that the vaccine prepared by using the exudate and scabs together gives better and quicker results than when the vaccine is prepared from the pox-scabs alone.

"Some 10,000 c.c. of vaccine have now been prepared and 9,000 injections made, 3,831 birds inoculated being recorded. On one place alone were three deaths placed by the owner against the vaccine. This, however, could have been avoided by the owner removing the exudate from the mouth of the trachea. There was no other mortality due to the vaccination.

"Owners of some 9,000 head of old stock are desirous, if opportunity offers, of having their stock injected.

"The Lower Mainland cases are about the same, having been held in check by a germicide in the water and treatment of parts affected. The epidemic is now present in a slight form in many of the Interior birds."

Tuberculosis amongst fowls continues to be on the wane, thanks to the work of the Department in conducting tests among cattle again during the year. With the elimination of this

scourge from farm animals, it will be only a short time before the disease will be unknown amongst poultry.

OFFICE-WORK.

This branch of the work has developed as in former years. The number of callers has been up to average, and the number of letters received and forwarded has increased owing to the additional work incidental to the duties of members of the Division as Inspectors under "Eggs Marks Act," Boys' and Girls' Poultry Club judging, etc.

Respectfully submitted.

J. R. TERRY,
Chief Poultry Instructor.

ANNUAL REPORT OF SOIL AND CROP DIVISION.

H. O. ENGLISH AND E. W. HOGAN.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

SIR,—We have the honour to submit herewith the annual report of the Soil and Crop Division for the year ending December 31st, 1917.

DEMONSTRATION STATIONS.

Eight demonstration stations were operated under the supervision of officials of the Soil and Crop Division during 1917. These were located at Armstrong, Chilliwack, Edgewood, Grand Forks, Rock Creek, Rose Hill, Errington, and Pitt Meadows.

With the exception of those located at Errington and Pitt Meadows, the Soil and Crop officials were assisted in the direction of the work by committees appointed by the local Farmers' Institutes. A local manager was employed on each station.

For various reasons it has been decided to discontinue work on all the above stations except that located at Pitt Meadows. In view of this fact we will include in this report a summary of the work attempted and the results obtained on each plot during the four years since the inception of the work.

Armstrong.—The field chosen for this station was situated about the centre of the large bench south-east of Armstrong, in the Northern Okanagan Valley. The soil on this bench was a heavy lifeless clay, almost devoid of humus and with poor natural drainage. The fertility of the soil was depleted by the continuous growing of grain-crops. An attempt was to be made to improve the fertility of the soil on the plot and to increase its productivity by methods within the means of the average farmer of the district.

The station, which consisted of 4 acres, was divided into five plots of equal size. In 1914 three plots were seeded to a mixture of oats, barley, and peas; one heavily manured and planted to corn, and the other summer-fallowed. The yield of 1,350 lb. of grain-hay or 2 tons of corn fodder per acre is a good indication of the condition of the soil. Two plots were seeded to alfalfa in rows in 1915, one summer-fallowed; the plot summer-fallowed the previous year was manured and planted to corn, while the 1914 corn-plot was seeded to oats. The two plots seeded to alfalfa were allowed to remain down to this crop for three years, while a rotation involving corn, oats, and summer fallow was followed on the other three plots.

Although the alfalfa had been planted in rows and the potato-cultivator used to cultivate the spaces between the rows, this crop made very little headway during the three years. In 1917 the alfalfa blossomed freely and gave promise of the production of a fair seed-crop. The crop when harvested yielded only about 20 lb. of seed per acre. Grasshoppers were very plentiful and were partially responsible for the low yield. Each year the plot to be summer-fallowed received 15 tons of barnyard manure. Deep ploughing was practised and the land frequently disked and harrowed. In 1916 sweet clover was seeded with the oats, the aim being to use this crop as a subsoiling agent and to plough it down in 1917 as a green manure. In spite of the good treatment the land received, the corn-crop never returned interest on the investment, while in only one year—1915—did the oat-crop pay for the cultivation of the land.

The station was so located that an experiment in underdrainage was out of the question. It would appear that underdrainage, deep cultivation, and a liberal application of lime would render conditions more favourable to crop production, but the expense involved prevents individual farmers from conducting the experiment.

Chilliwack.—The land chosen in 1914 for this station in the Lower Fraser Valley was located on the property of Mr. Gardiner, adjoining the east road between Chilliwack and Sardis. The soil was a clay loam, lacking humus. The land was very weedy.

In 1914 the station, which consisted of 4 acres, was divided into four plots of equal size. While it was decided to ultimately adopt a crop-rotation including corn and roots, oats, clover mixture for hay, and clover mixture for pasture, in 1914 one plot was seeded to oats and vetches, one to corn and sugar-beets, one to oats, and one to vetches. Eventually the plan of pasturing one plot each year was altered to that of harvesting one crop of hay from the second-year clover-plot and the cultivation of the plot for the balance of the season to eradicate the Canadian thistle and couch-grass. Each year the plot selected for the corn and roots received a dressing of about 15 tons of barnyard manure per acre.

Minnesota No. 13 corn was grown on ¾ acre each year, and during 1915-16-17 seed-corn of this variety was saved. Between 900 and 1,000 lb. of first-class seed was harvested each year. By selecting for early maturity an earlier ripening strain has been developed. On the remaining fourth of this plot mangels were grown. During 1915-16-17 the Sludgstrop variety was used. The preparation of the plot for mangels was practically the same each year, and under the cultural methods employed a marked increase in yield has been recorded each year except 1916, when climatic conditions were unfavourable. The yields by years per acre were:—

	Tons per Acre.
1914	21⅔
1915	37⅔
1916	33
1917	42

Oats followed corn in the rotation. Banner oats were grown each year until 1917, when the acre plot was divided into four equal plots and four varieties—viz., O.A.C. No. 72, Garton No. 22, Seger, and Banner. These were grown under identical conditions as a variety test.

The oats were seeded at the rate of 50 lb. per acre. With the oats, as with the mangels, an annual increase in yield has been recorded, as follows:—

	Lb. per Acre.
1914	Cut for hay.
1915	1,630
1916	2,285
1917	2,911

The oat-plot was seeded down each year to a mixture of red clover and alfalfa, 12 lb. of the former and 6 lb. of the latter. Two crops of clover-hay were harvested the first year after seeding, which yielded from 4½ to 5 tons per acre each year. The second year after seeding down to hay mixture only one crop of hay was removed, the second crop being turned under to improve the condition of the soil and the plot cultivated in such manner as to weaken the weeds which infested the land.

Couch-grass was the worst weed with which we had to contend. The practice was to plough the land about 5 or 6 inches deep about the first week in August, and then cultivate frequently with the spring-tooth and drag harrows to drag the roots of the couch-grass to the surface and expose it to the sun. When dry the roots were burned.

The success of this method of eradicating this weed may be judged from the following: In 1916 the cultivation of the corn and mangel plot to control the weeds where special cultivation had not been practised in 1915 cost the Department $51.20, while the cost during 1917 was only $40.50. The weeds were easily controlled in 1917 with less cultivation, although this plot had been the most weedy part of the station in former years.

It should be mentioned that the alfalfa-seed was mixed with the clover-seed to inoculate the soil with a view to future alfalfa-culture. The alfalfa in every case survived and produced even more sturdy growth during the second year after seeding.

The Division has been successful at this station in improving the soil condition, greatly increasing crop yields, and at the same time bringing the weeds under control by methods within the means of the average farmer of the district.

Edgewood.—This station was located in 1914 on the property of Mr. Wm. Calder, about four miles from Edgewood, on the Arrow Lakes. The soil was a very heavy clay. The 4 acres comprising the station was divided into three plots of equal area, and a rotation involving an intertillage crop, a grain-crop, and clover was adopted.

This station was operated during four seasons. Deep cultivation was practised and from 10 to 15 tons of manure applied to the intertillage plot each year.

The mangels were a total failure and this crop was dropped from the rotation in 1916. The corn-crop was given a three-year trial and discontinued in 1917. The soil was too wet in the winter, sour in the spring, and baked too hard during the early summer to permit the successful culture of either of the above crops. Underdrainage and a heavy application of lime were recommended, but labour was too scarce and the revenue too small to warrant the expenditure.

Oats and clover yielded fairly well each year, the oats averaging about 1 ton and the alsike clover about 4 tons per acre.

Grand Forks.—The centre of the Agricultural Association grounds at Grand Forks (Kettle Valley District) was selected as the most suitable location for a demonstration station for the district. The plot consisted of 4 acres of silty soil.

The crop-rotation adopted in 1914 included summer fallow, intertillage, grain, and alfalfa. Existing conditions at this station have proven the location to be unsuitable for demonstration-work. There were no facilities for irrigation. The annual rainfall was not sufficient to produce a crop, and the growing crops were forced to depend upon subirrigation subsequent to the rise of the river in midsummer for their moisture. The river did not rise to the same height each year, and the consequent variation in amount of moisture supplied to the crops caused considerable variation in yield. In addition to this, the fence around the association grounds was not cattle-proof and the crops were frequently damaged by the live stock of the district.

The crops at this station yielded very fair returns in 1915 when sufficient moisture was available. Only partial crops were harvested in 1914-16-17.

One interesting feature of the work at this station was the way in which the alfalfa survived the midsummer drought each year to produce one fair crop of hay the following spring. In 1916 this crop appeared to suffer severely from drought and it was feared it would not survive. However, it not only survived, but produced a first cutting of hay on June 29th, 1917, which yielded at the rate of 5,500 lb. per acre.

Rock Creek.—A part of A. D. McLennan's farm on the Rock Creek-Bridesville Road was selected as the most suitable location for demonstration-work in the Rock Creek District. Work was begun at this station in 1914. One acre was devoted to the culture of alfalfa seeded broadcast, while the balance of the station (4 acres) was divided into five plots, and a crop-rotation, including alfalfa, intertillage, oats, and summer fallow, adopted.

The soil was a clay loam. Barnyard manure was not available; hence a cropping system was adopted which provided for the ploughing-down of a crop of peas each year on the plot to be summer-fallowed.

Results at this station have varied. Corn and mangel growing was attempted, but unsatisfactory yields were obtained, due in part to the poor condition of the soil and also to the high altitude and cool nights. The alfalfa caught readily when good seed was available and only winter-killed slightly. In districts such as this only the best of the hardiest strains of alfalfa should be used.

The oat-crop gave a maximum yield in 1916 of about 90 bushels per acre. All crops suffered from drought and gophers in 1917 and were harvested for hay during July.

Rose Hill.—Demonstration-work was commenced in 1914 on C. R. Green's farm, near the Beresford School, south of Kamloops, which was to serve that large mixed-farming district. A corner of Mr. Green's farm near the road which contained about 8 acres was selected. The soil near the road was a clay loam. The land sloped into an alkali pond, about 1 acre along the pond being affected by alkali.

The rotation adopted included alfalfa, summer fallow, intertillage, and grain. While the alfalfa lived, it did not produce a satisfactory crop of hay in three years. The intertillage crops—corn and roots—were given a three-year trial, but failed to produce profitable yields in any year, the maximum being about 10 tons of mangels and 3 tons of immature fodder-corn per acre. It was then planned to try mixtures of oats, wheat, vetches, and peas in order to

determine which combination gave the heaviest tonnage for silage purposes. Oats and peas gave a maximum yield of 6 tons per acre.

Banner oats were grown for seed following the intertillage crop. The yields per acre by years were:—

	Oats. Lb.	Wheat. Lb.
1914	1,231	...
1915	2,272	1,646
1916	1,726	1,886
1917	1,776	2,232

Considering climatic conditions in this district during 1916 and 1917, the yields obtained would tend to indicate that either the cultural methods or the seed-selection practised had produced definite positive results.

In the winter of 1916-17 the fall-sown wheat, oats, and vetches winter-killed so badly that peas and flax were seeded as a catch crop. Three varieties of peas—Arthur, Solo, and Prussian Blue—were sown, the Arthur giving by far the greatest yield. The flax yielded approximately 12 bushels per acre. The above plot was not seeded until May 26th and the rainfall was negligible.

Errington.—This station was located in 1914 on the property of the Vancouver Island Fruitlands, Limited, near the Errington Post-office. Prior to 1917 about 13 acres were cultivated. In 1917 an additional 7 acres were seeded. The soil was variable, there being about 15 acres of black muck and 5 of gravelly loam.

The rotation adopted included corn, grain, and hay crops. Barnyard manure, except in limited quantities, was not available, only four dairy cows, three horses, and a few pigs being fed at the station. The manure was applied each year to the land to be devoted to corn. No commercial fertilizer was purchased after the first year, yet by practising crop-rotation, through cultivation, and utilizing all available manure the crop yields have been gradually increased, until in 1917 maximum results were obtained. Fodder corn yielded approximately 7 tons, clover-hay about 2 tons, and barley ½ ton per acre.

Pitt Meadows.—The site for this station (near New Westminster) was chosen in 1915. A part of F. V. Harris's farm was considered most suitable. The surface soil is a mixture of peat and undecayed vegetation and the subsoil a silty clay.

Work was not commenced on this station until the autumn of 1916, when the land was ploughed deeply and a system of tile drains installed. These worked satisfactorily during the winter of 1916-17.

Demonstration-work was commenced in 1917. The station was divided and subdivided in order to demonstrate the effect of various methods of soil-treatment on the common mixed-farming crops.

On a part of the station, oats, barley, and turnips were grown on plots which had previously received applications of various fertilizers. The balance was divided into five large plots. Barnyard manure was applied to the first plot at the rate of 20 tons per acre and lime at the rate of 1½ tons per acre. The second plot received an application of lime only. The third plot was not treated and served as a check. Plot No. 4 received an application of barnyard manure, while commercial fertilizers (sodium nitrate and superphosphate of lime) were applied to Plot No. 5. Sodium nitrate was applied at the rate of 100 lb. and superphosphate 300 lb. per acre. These plots were subdivided and the effect of the various applications on the common mixed-farming crops tested. The crops grown were oats, barley, peas, flax, vetches, millet, fodder corn, mangels, turnips, carrots, and potatoes.

Heavy rains in June caused a rapid rise of water in the main ditches and tile drains. The land became too soft to bear the farm-horses and cultivation was delayed. This allowed the weeds to gain temporary control, and necessitated the harvesting of some of the crops for hay to prevent the ripening and scattering of the weed-seeds.

The plots receiving a treatment of barnyard manure and lime produced the heaviest yields of marketable produce. On the small series the presence of manure was readily noticeable whenever used, while on the larger series the lime-and-manure treatment was followed in almost every instance by manure alone, and this by lime. The crops grown on the plots receiving commercial-fertilizer treatment were very little better than those on the check-plots.

Banner and Leader oats were tested under similar conditions. It was estimated that either variety would yield over 100 bushels per acre on the plot treated with lime and manure. On the series the Banner averaged approximately 80 bushels per acre, while the Leader yielded 85 bushels per acre. Both varieties lodged badly.

The barley was damaged more than the other crops by the high water in June. Except on the manure and lime and manure plots, it was entirely drowned out. Vetches, peas, and flax grew very satisfactorily, but only matured properly on plots receiving manure. The Longfellow fodder corn gave the heaviest yield, followed by the North-west Dent and Minnesota No. 13 in the order named.

The following table gives the yield per acre of the various root-crops:—

Fertilizer Tests with Root-crops.

Plot.	Treatment.	Mangels.		Turnips.		Carrots.
		Sludgstrop.	Long Red.	Jumbo.	Magnum Bonum.	
		Tons.	Tons.	Tons.	Tons.	Tons.
1	Lime and manure	8.940	14.257	17.641	14.592	13.939
2	Lime	1.089	3.484	12.414	6.752	8.276
3	Check	0.653	0.653	2.832	2.613	8.712
4	Manure (alone)	5.880	4.138	11.543	17.859	12.632
5	Commercial fertilizer	...	...	5.227	3.920	6.534

NOTE.—Mangels were a complete failure on Plot No. 5.

It will be noted that with all varieties except the Jumbo the manured plots yielded more than the limed plot. The mangels were most affected by the absence of barnyard manure and the carrots least affected, while turnips were intermediate. (For table showing yield per acre of potatoes *see* Appendix No. 13.)

DEMONSTRATION CLOVER AND ALFALFA HULLING.

The 1917 season was not favourable to the growing of alfalfa and clover seed. The rainfall was light and injurious insects plentiful. Labour was not available, and many who planned in the spring to save a part of their hay-crop with a view to seed production, later abandoned the idea and cut the crop for hay.

The Department clover and alfalfa huller was operated in three districts only—Edgewood, Kelowna, and Armstrong. Ten farmers availed themselves of the Department's offer and had their seed-crops threshed, paying at the rate of $1 per bushel of seed threshed. During the season there were threshed by the machine 1,190 lb. of clover-seed and 1,685 lb. of alfalfa-seed. All of the seed threshed will be disposed of locally.

DEMONSTRATION UNDERDRAINAGE.

The need for underdrainage in certain parts of the irrigated districts of the Province has become more evident each year, yet, owing to the high cost of drain-tile and the scarcity of labour, very few drainage systems have been installed. The most serious need was found in the Summerland and Kelowna Districts, where irrigation-water carries the soluble salts down from the benches and, evaporating, deposits large quantities in the lower lands. The need for some efficient system of drainage to remove this surplus water is becoming more urgent each year.

In an endeavour to assist the farmers of the above districts the Department purchased a "Cyclone" ditcher and offered to loan it, together with the services of a drainage expert, to the farmers free of charge. Seven farmers availed themselves of this offer during 1917. The official in charge of this work visited the various farms, surveyed the fields needing drainage, and advised the various owners regarding the best way to cope with the situation. Although the ditching-machine was purchased early in February, it was not delivered until late in September. As a result, very little actual underdrainage-work was done. The machine was operated on one

farm in the Summerland District, where a field of 2 acres was ditched. The machine worked satisfactorily to a depth of 28 inches. While no data are available as to the actual cost of removal of earth by this method as compared with other methods, those in charge of the work consider that for the excavating of long ditches, where frequent turning is unnecessary, this machine should materially assist in reducing the labour problem incident to work of this nature.

DEMONSTRATION SEED-CLEANING.

Farmers' Institutes were notified early in the year by circular letter that the Department had purchased a "Clipper" seed-cleaner and was prepared to conduct demonstrations in seed-cleaning. Thirteen Farmers' Institutes applied for demonstrations, but owing to conflicting dates only eleven were conducted. Seed was cleaned in the following districts: Bridesville, Chilliwack, Duncan, Kaleden, Kelowna, Lumby, Nanaimo, Pitt Meadows, Pritchard, Vernon, Victoria, and Westbank. Sixty-five farmers were benefited in actually having seed cleaned, while a large number of others were present at the demonstrations and benefited indirectly. Between 50 and 60 tons of seed was cleaned. Seventeen kinds of seed were put through the machine, including wheat, oats, barley, speltz, peas, beans, alfalfa, clover, mangel, cabbage, onion, parsnip, radish, tomato, sweet peas, and flower-seeds.

While the "Clipper" cleaner will remove all very small, oversized, and light seed as well as refuse, it does not separate the foreign seeds of similar shape or weight. A few of those attending the demonstrations claimed that they had fanning-mills at home that were more efficient than the "Clipper," but as they had failed to take advantage of the Department's invitation to bring such machines to the demonstration, their claims were not substantiated. The "Clipper" used by the Department was a No. 2 B. The machine could be more conveniently operated were some means provided to prevent seeds lodging in the lower screen; otherwise the work was quite satisfactory.

FIELD-CROP COMPETITIONS.

A bulletin announcing the results of the 1916 crop competitions and seed fairs was published in February. In this bulletin the rules and regulations governing the 1917 field-crop and seed competitions were announced. A few important changes were made in the rules, including:—

(*a.*) The increasing of the number of entries necessary from six to eight.

(*b.*) A reduction in the total amount of prize-money paid per competition from $45 to $30, and the division of this among the five successful competitors as follows: $10, $8, $6, $4, $2.

(*c.*) The offering of a special institute prize to the institute conducting the most successful competition. (The special institute prize consisted of ten of the best agricultural periodicals published in Canada and the United States; these to comprise the nucleus of a circulating library in the district qualifying for same.)

(*d.*) A special machinery prize to any competitor winning a first prize in a keenly contested competition.

Eighty competitions were conducted with a total entry-list of 718 plots. Competitions with potatoes, oats, wheat, and grain-hay were again popular, as the following list indicates:—

Kind of Crop.	No of Competitions.
Potatoes	40
Oats	11
Grain-hay	9
Wheat	8
Mangels	3
Carrots	3
Corn	2
Clover, alfalfa, turnips, and kale	1 each

The Metchosin Farmers' Institute was awarded the special prize provided for the institute conducting the most successful competitions. This institute conducted competitions with potatoes and grain-hay, having an entry-list of twenty in the former and fourteen in the latter. The majority of the competitors in each competition appeared to be deeply interested in the scoring of the plots, and the judges report having spent two interesting days in that district.

Special prizes were awarded to the winners of eleven competitions, in which the interest evinced was exceptional and the scoring close. The districts in which special prizes were awarded, the winners of the prizes, and the prizes chosen in each case are given below:—

District.	Winner.	Address.	Prize selected.
Bella Coola	O. J. Nygaard	R.R. 1, Bella Coola	Planet Junior.
Cowichan	P. W. Anketell-Jones	Chemainus	Potato-cultivator.
Eagle River Valley	A. Anderson	Malakwa	Potato-cultivator.
Kelowna	A. W. Cooke	Kelowna	Seed-cleaner.
Nicola	R. W. Dodding	Lower Nicola	Seed-cleaner.
Metchosin	Geo. Ball	Rocky Point	Portable spraying outfit.
Metchosin	Percy D. Hillis	Rocky Point	Potato-cultivator.
Revelstoke	J. J. Malcolm	Revelstoke	Potato-cultivator.
Rock Creek	William Johnson	R.R. 1, Rock Creek	Potato-cultivator.
Rose Hill	C. R. Green	Kamloops	Seed-cleaner.
Victoria	Chas. E. King	Cedar Hill	Planet Junior.

In districts were the seed-cleaner was the prize chosen, the present holder must win the prize a second time before it becomes his property.

Seed Fairs.

The Field-crop and Seed Competitions Bulletin published in February contained the announcement of the rules governing the local and Provincial seed fairs. The prize-list was published at the same time. Provision was made in this bulletin for the holding of two Provincial and eight local seed fairs. After the bulletin went to press the Island farmers were granted a seed fair.

The labour shortage was so acute that districts formerly holding local seed fairs were forced to abandon the practice in 1917. As a result, only the three Provincial seed fairs were conducted.

The Islands Seed Fair held at Duncan, November 29th and 30th, brought out the largest entry-list and the greatest variety of exhibits. As the first Islands Seed Fair the showing was creditable. The Southern Interior Seed Fair was held at Armstrong, December 6th and 7th. The classes were well filled and competition keen, although prevailing conditions in this district in 1917 were not favourable to seed production. The showing at the Central Seed Fair, conducted under the auspices of the Department at New Westminster, December 13th and 14th, was not satisfactory. Some exhibits of outstanding quality were placed, but competition was lacking. In view of the possibilities for seed production in the central district, this lack of interest is inexcusable.

The feature of the seeds fairs in 1917 was the quality of the exhibits of root, vegetable, and flower seed.

A seed-growers' directory was compiled from the lists of those competing at the 1916 seed fairs, and published early in January. This directory contained the names of the seed-growers competing in the various classes, the variety exhibited by each, the quantity of seed for sale, and the price asked. This directory was mailed to all Secretaries of Farmers' Institutes and to others on request. This publication assisted materially in bringing those needing seed into touch with the seed-grower. A similar one is being prepared containing a list of the exhibitors at the 1917 seed fairs.

Seed-growers' meetings were held in conjunction with the seed fairs. Professor L. Stevenson, Superintendent of the Dominion Experimental Station at Sidney, B.C., addressed meetings at all three fairs, while Professor P. A. Boving, of Vancouver, assisted at Duncan. E. W. Hogan, of the Department, assisted at Armstrong, and P. W. Anketell-Jones, of Chemainus, addressed a meeting at New Westminster.

Co-operative Variety Testing.

The scarcity of reliable information as to the varieties of the mixed-farming crops best suited to soil and climatic conditions in the various agricultural districts of the Province has resulted in each farmer growing those varieties which he considered best. As a net result of this lack of data, one would experience considerable difficulty in placing in any one district of

the Province an order for a car-load of seed-grain or potatoes of any one variety. As an initial step toward the settlement of this uncertainty the Department decided in 1916 to distribute samples of first-class seed of the more important field crops to farmers in the various districts. The public was notified of this contemplated action early in January through the Farmers' Institutes. The Department offered to supply 10-lb. samples of each of three varieties of wheat, oats, and barley; 15-lb. samples of each of three varieties of potatoes; and 1-lb. samples of each of three varieties of fodder corn. At the same time 5-lb. samples of seed and fibre flax and 1-lb. samples of sugar-beets were offered for distribution.

The public appeared to realize the need for reliable data as to adaptability of varieties to local conditions, and this office was flooded with applications for seed. Unfortunately, the Department's supply of seed was limited and many applicants were disappointed. Below is a list of the varieties and the number of samples of each distributed:—

Crop.	Variety.	No. of Samples.	Total Quantity of Seed distributed.
			Lb.
Wheat	Marquis	93	930
„	Red Fyfe	93	930
„	Bluestem	93	930
Oats	Banner	60	600
„	Seger	53	530
„	Garton No. 22	64	640
„	Leader	57	570
„	O.A.C. No. 72	40	400
Barley	O.A.C. No. 21	47	470
„	Beardless	47	470
„	White Hull-less	47	470
Corn	N.W. Dent	95	95
„	Minnesota No. 13	95	95
„	Longfellow	95	95
Potatoes	Burbank	100	1,500
„	Carmen No. 1	99	1,485
„	Gold Coin	94	1,410
„	Netted Gem	101	1,515
„	Eureka	99	1,495
Flax	Seed	47	235
„	Fibre	47	235
Sugar-beets	Vilmorin	191	191
Totals		1,757	15,291

About 10 per cent. of those receiving seed report crop-failures, due either to unfavourable climatic conditions or to the ravages of live stock.

Reports already received would seem to indicate that results differ with climatic conditions in the various parts of the Province. A summary of the results compiled from reports received is given in the following tables. The numbers in the columns represent the suitability of the varieties to the various districts as determined from the reports received.

Summary of Results with Wheat Varieties.

	Bluestem.	Marquis.	Red Fyfe.
Islands	1	2	3
Lower Mainland	2	3	1
Central Interior (Nicola to Revelstoke and Okanagan)	1	2	3
Boundary and Kootenays	1	2	3
Northern Interior	1	3	2

Summary of Results with Oat Varieties.

	Banner.	Seger or Victory.	Garton No. 22.	Leader.	O.A.C. No. 72.
Islands	4	5	2	1	3
Lower Mainland	3	2	4	1	5
Central Interior	2	3	4	5	1
Boundary and Kootenays	1	5	4	2	3
Northern Interior	2	1	3	..	..

Summary of Results with Barley Varieties.

	O.A.C. No. 21.	Beardless.	White Hull-less.
Islands	1	2	3
Lower Mainland	1	3	2
Central	1	2	3
Boundary and Kootenays	1	2	3
Northern Interior	1	2	3

Summary of Results with Potatoes.

	Burbank.	Carmen No. 1.	Gold Coin.	Netted Gem.	Eureka.
Islands	2	4	1	5	3
Lower Mainland	2	3	4	5	1
Central Interior	1	2	4	3	5
Boundary and Kootenays	3	3	5	4	1
Northern Interior	4	3	2	5	1

Owing to the variation in climatic conditions within the various districts, the results compiled from one year's test should not be considered as final, but rather as a preliminary report. It will be necessary to continue this line of investigation for at least five years, using the best seed available each year, before the results may be considered reliable. While the above tables give the actual rating of the different varieties in the various districts as regards yield, other factors, such as the disease-resistance of the variety, its quality, suitability to market, etc., must be considered in determining which variety should be grown.

The Bluestem, while the heaviest-yielding variety of wheat is soft, and as such had not as high a milling value as either of the other varieties. The Marquis had the strongest straw.

Of the oats, the Banner and the O.A.C. No. 72 have a long thin kernel, the Seger a kernel of medium size, and the Leader and Garton No. 22 very plump kernels. The Garton No. 22 has perhaps the strongest straw and is the earliest of the five varieties. The O.A.C. No. 72 displayed exceptional strength and length of straw in view of its fineness. The Leader, a coarse-strawed variety, produced the heaviest yields in the Coast districts, but did not stand up well. The Seger or Victory is a very pretty oat, straw medium fine, kernel medium size, and yield fair in all districts.

The O.A.C. No. 21 barley outyielded the other variety in almost every test, in many instances producing almost as much as the other two varieties combined.

Seasonal variation and the source of the seed used has such an important relation to the crop yield with potatoes that conclusions drawn from a one-year test are apt to be misleading. The rating in the above tables should be taken as a preliminary report only.

COST OF PRODUCTION SURVEY.

As in 1916, those entering in the field-crop competitions were induced to keep records of the cost of producing the crops entered. Some interesting data compiled from such reports are submitted in Appendix No. 14.

Potatoes on a Francois Lake ranch.

Alfalfa planted in rows with a view to seed production. Two pounds of seed used per acre.

Pure-bred Jerseys at Keating.

The costs are based on the actual cost of farm crops in storage on the farms on December 31st. From data submitted by eighteen farmers the actual cost of delivering potatoes at the market shipping-point entailed a further expenditure of $4 per ton. Adding this to the cost of producing a ton of potatoes as submitted in the table in Appendix No. 14, the cost f.o.b. shipping-point would be $16.90.

In view of the recent controversy as to the actual cost of production of farm crops, it is interesting to compare the 1917 reports with those submitted in 1916.

	Yield, 1916.	Yield, 1917.	Decrease.	Cost, 1916.	Cost, 1917.	Increase.
	Tons.	Tons.	Per Cent.			Per Cent.
Potatoes (field crop)	9.85	8.12	17.6	$ 9.77	$12.90	32.3
Potatoes (boys and girls)	9.94	7.00	29.5	9.64	15.88	64.7
Wheat	1.46	85	41.2	19.12	32.00	67.3
Oats	1.15	90	21.7	20.70	33.07	60.0
Grain-hay	2.00	3.40	...	7.64	9.57	25.2
Carrots	20.00	25.00	...	3.31	3.78	14.2

Lack of rain during June, July, and August was responsible for the lighter yields of potatoes and grain-crops. The root-crops benefited by the early fall rains. It is interesting to note that, while there was a decrease in yield per acre of from 15 to 40 per cent. and an actual increase in cost of production in 1917 over 1916 of from 32 to 67 per cent., the actual increase in the price to the farmer did not on any of the above crops exceed 10 per cent.; while in the case of potatoes there was a decrease of 8.5 per cent. Considering shrinkage in storage, losses due to disease, etc., and the average price paid to growers of potatoes to the end of 1917—i.e., $23.10 per ton—the grower selling his potato-crop at or even a little above the average price has lost money on the crop.

Farm and Crop Inspection.

Over 1,000 farms were visited by officials of this Division during the year and land or crops inspected. A number of farmers were visited and seed-plots scored for the Canadian Seed-growers' Association.

In addition to the above, officials of the Division assisted with the judging of the Boys' and Girls' Club competitions. One hundred and two potato-plots were scored during the growing season. Harvested exhibits from the plots were scored at the Provincial seed fairs, and the financial reports and essays received and scored at this office.

Meetings, Short Courses, and Fall Fairs.

Officials of the Division conducted or delivered addresses at twenty-one farmers' meetings during the year. The wide range of subjects included underdrainage, fertilizers, soils, seed-growing, potato-growing, weed-eradication, mixed-farming crops, and crops for ensilage.

Judges were supplied who assisted in the placing of the awards at a number of the fall fairs.

Correspondence.

The correspondence for the year consisted of 1,869 letters being filed and 2,562 dispatched. This is an increase of 15.3 per cent. over 1916 and an increase of 39 per cent. over 1915.

Respectfully submitted.

H. O. English,
E. W. Hogan,
Soil and Crop Instructors.

ANNUAL REPORT OF CHIEF VETERINARY INSPECTOR.

A. KNIGHT.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

SIR,—I beg to submit my report of the Veterinary Division for the year ending December 31st, 1917.

The early part of the year was devoted to meetings of various Farmers' Institutes, more particularly in the Okanagan and Kootenay and Columbia River Valleys. The report on these meetings has been submitted.

Considerable time was given to assisting stock-owners in the outlying districts by correspondence for the common ailments among their stock, and in a number of instances a personal visit was made and treatment advised.

VERMINOUS BRONCHITIS.

The experience of your Inspectors during the year with this trouble was confined to young stock, mostly under one year of age. The disease was confined to those localities as reported in 1916; that is, those lands subject to overflow in the early summer and after the water has receded. Treatment was adopted as advised on stock already affected, with good success, and the fatalities were practically *nil*. Stock-owners were also advised to keep young stock off contaminated pastures, as a precautionary measure.

INFLUENZA.

An outbreak was reported from the Columbia Valley, where two horses had died. On investigation it was found that death was due to pneumonia, following an attack of influenza. The remaining affected animals were isolated and treated. No further trouble was reported from this source.

CONTAGIOUS ABORTION.

This trouble, which was reported widely in previous years apparently gave very little concern in 1917, only two outbreaks being reported. The one case, your Inspector is satisfied was due to mechanical means, and not of a contagious nature. In the other case, by isolation and treatment by use of disinfectants the trouble was confined to three cows in the herd.

SANITARY CONDITIONS OF DAIRIES AND STABLES.

In the older and more progressive districts some improvements have been noticeable; the erection of new stables, more light, better floors and drainage have been adopted, and more thought given to the health and comfort of stock. Other sections are making little, if any, improvement, especially in those localities where the owners of farms have retired and the farms are leased; the owner refuses to expend money on improvements, and the renter refuses to improve the buildings unless he has a long lease. Those dairymen with Grade A premises, it is believed, are maintaining their standard for quality of their dairy products, and this may be said also of a good many of the Grade B class.

TUBERCULOSIS.

The time of the Veterinary Inspectors was devoted largely to dealing with this disease. During the year 15,398 head of cattle on 1,889 premises were tested, with the result of 579 reactors and 54 suspects. Of these reactors 526 were killed; 53 reactors and 54 suspects remain in quarantine. The great bulk of these will be disposed of very shortly. The number of reactors to the number tested figures out at about 3.75 per cent., which result is very gratifying compared with previous years, more especially since this work has been confined to the more thickly settled districts and where tuberculosis was more prevalent in former years. (For districts in which the cattle have been tested, number of premises visited, cattle tested, reactors, and suspects, *see* Appendix No. 15.)

Respectfully submitted.

A. KNIGHT,
Chief Veterinary Inspector.

ANNUAL REPORT OF DISTRICT AGRICULTURIST, KAMLOOPS.

Geo. C. Hay.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit my annual report as District Agriculturist for the Kamloops District in 1917.

Activities.

During the year 1917 your Agriculturist has served in his capacity for two different districts. The first six months of the year were spent at Smithers as headquarters for the Bulkley Valley, Central British Columbia, and the balance of the year at Kamloops as headquarters for the surrounding district, including Cariboo, Lillooet, and the Nicola Valley.

The time during the winter months was mainly spent in holding institute meetings at different points along the Grand Trunk Pacific Railway and in making personal visits to as many of the ranchers as could be conveniently visited. In the early spring the applications for seed-grain were received, and three car-loads distributed to the applicants before your Agriculturist left early in June for the Kamloops District.

After reaching Kamloops an endeavour was made to cover that district in so far as possible, and while doing so meet the settlers and discuss their problems with them, and become familiar with conditions in the different localities, as well as the individual problems confronting the settlers therein. This, together with the supervision of the two dry-farming stations at Quilchena and 105-Mile House, kept your Agriculturist busy during the latter six months of the year.

Live Stock.

The Kamloops and Cariboo Districts have for many years been famed for beef-raising. They are recognized to-day as amongst the largest, if not the largest, open range countries in Western Canada. The cattlemen have had a good year. Beef has been a good price and many car-loads have been shipped out. This high price, however, has not influenced the cattlemen to dispose of their breeding animals as might be supposed. All are assured of a stable market for some years to come. In almost every case breeding animals have been conserved in so far as it was possible. The small hay-crop last season rendered it necessary for some of the owners to diminish their number of cattle. The late winter now is of untold value to them in bringing their cattle through in good shape.

Dairying has been successfully practised to some extent in the vicinity of Kamloops. A creamery was opened in the town in June, 1917, and by December 31st 15,000 lb. of butter had been made. This creamery has fifty patrons at the present time, and several other farmers have expressed their intention of starting in dairying, thus making the outlook promising.

The sheepmen in the Kamloops-Cariboo District did exceptionally well on their flocks in 1917, due chiefly to the high prices paid for wool and mutton. However, a small proportion of the wool sold in this district realized the top market price. A very small number of the ranchers co-operated and sold their wool through the Wool-growers' Association at Kamloops. It is believed, however, that the results of marketing wool co-operatively were demonstrated sufficiently by the association last year that it will have practically all the wool in the district to handle next spring.

Crops.

The season of 1917 was anything but favourable to the development of good crops throughout most parts of the Kamloops District. The cold, backward spring seriously withheld the growth of most crops, and later during the months of July and August a continued spell of dry weather seriously affected those who were practising dry-farming. The crops in the Nicola Valley, generally speaking, were better than those in most other districts, especially the oat-crop. The hay-crop in general was light, and at present the ranchers realize there is not a superabundance of hay in the country for the number of cattle that are being kept over.

Summer frosts towards the latter part of July caught some of the crops in places along the Cariboo Road and in the Bonaparte District. The potatoes in several places did not recover from a frost that occurred on July 24th. No frosts occurred in the Thompson River Valley until October, when beans were damaged somewhat in several sections.

FALL FAIRS.

The fairs visited during the past season were: Knutsford, Vancouver, Prince George, Hefferly Creek, Armstrong, Kamloops, Quesnel, and Summerland. Of these, your Agriculturist judged the cattle at Knutsford, the live stock and field produce at Prince George and Quesnel, and the live stock at Summerland. At the fairs attended a good interest was shown and a keen desire on the part of the exhibitors to help the fair along.

FIELD-CROP COMPETITIONS.

The field-crop competitions judged during the summer were as follows: Wheat and potatoes for the Martin's Prairie Farmers' Institute, and oats for the Nicola Valley Farmers' Institute. The Roe Lake Institute found it necessary after a rather severe frost to call off their crop competition for the season. The three competitions at Pritchard and Nicola were very well conducted, and, generally speaking, there was keen competition; especially was this the case with the Nicola Valley oat competition.

OFFICE.

The patronage to this office on the part of the local farmers and of those interested in the work of the Department of Agriculture is most encouraging. A live interest has been taken in the work, and anything that the Department can do to further the interests of agriculture in the District of Kamloops is greatly appreciated by all concerned.

Respectfully submitted.

GEO. C. HAY,
District Agriculturist.

ANNUAL REPORT OF SILO DEMONSTRATOR.

R. J. FERRIS.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

SIR,—I beg to submit herewith my report of the silo-demonstration work for the year 1917.

As the work of this part of the Live Stock Branch develops, there is an increasing desire by the farmers of British Columbia to become more acquainted with the merits of silage as an aid to the cheaper production of live stock. Operations have covered to a large extent the southern part of the Province, where on every hand the familiar type of silo which the Department has advocated for the last three years is observed. The initial policy of placing the silos in the outlying districts, such as the Okanagan, Arrow Lakes, Kamloops, etc., instead of the more thickly settled parts of the Province, has proved a first-class method of advertising, with the result that they are now being built more rapidly. The offer of assistance to the first farmer in an institute district who erects one of the type of silos recommended by the Department has taken advantage of by 30 per cent. of the Farmers' Institutes. There are still a large number of institute districts where they have not yet begun to feed silage to their cattle, which is an economic necessity, and the modern dairy-farm is not complete without a silo.

Under your instructions, a circular entitled "The British Columbia Farmer and his Silo" was compiled. The information it contained has been the means of a large number of farmers building silos. Some 2,500 of these circulars were printed and 2,400 have been distributed. There has also been a large demand for the bulletin entitled "Silos and Silage."

The correspondence in connection with this work is increasing: Letters received, 320; letters sent out, 450.

Twenty-three silos have been erected by the Department representatives and thirteen filled. (For tables showing silos built and filled *see* Appendices Nos. 16 and 17.)

Respectfully submitted.

R. J. FERRIS,
Silo Demonstrator.

Clover and alfalfa huller, owned by Department of Agriculture, Victoria, B.C.

Home-made silos on a British Columbia farm.

A good crop of timothy in the Bulkley Valley.

REPORT OF PUBLICATIONS BRANCH FROM NOVEMBER 5TH TO DECEMBER 31ST, 1917.

M. A. STUART.

W. T. McDonald, Esq.,
Live Stock Commissioner, Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith a brief report of the work of the Publications Branch from November 5th to December 31st, 1917.

On taking temporary charge of the work of this Branch following J. R. McLennan, the duties assumed were as follows: The publication of the *Agricultural Journal*, mailing out bulletins, etc., issued by the Department, and answering correspondence in connection with the Branch.

OFFICE.

During the last two months of the year, 196 letters were received from farmers, Secretaries of Farmers' Institutes, and various other agricultural organizations, asking for bulletins and other publications. A number of subscriptions to the *Agricultural Journal* were received from both old and new subscribers. There were sent out 93 letters and 106 bulletins to various farmers, Secretaries of Farmers' and Women's Institutes, Agricultural Colleges and Schools, and Departments of Agriculture throughout Canada and the United States.

AGRICULTURAL JOURNAL.

This *Journal* at the end of the year contained twenty pages, but judging by the rate material is now coming in from outside, and the lengthy articles written by members of this Department, an increase of eight pages more will be necessary. The mailing-list, together with the names of subscribers, are so arranged in alphabetical order on filing-cards that in future the mailing of the *Journal* and other publications will be much easier.

I hereby acknowledge the valuable assistance rendered this Branch by members of the Department and outside correspondents in supplying articles for the *Journal*.

Respectfully submitted.

M. A. STUART, *Agriculturist.*

ANNUAL REPORT OF SECRETARY FOR THE DEPARTMENT OF AGRICULTURE.

WM. J. BONAVIA.

Wm. E. Scott, Esq.,
Deputy Minister of Agriculture and Superintendent of Institutes,
Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my report on the general work of the Department for the year ending December 31st, 1917.

STAFF.

The Estimates for the fiscal year ending March 31st, 1918, provided for forty-four permanent officials of all ranks. The year has been marked by an unusual number of resignations; the following table briefly records the details:—

Resignations.

Name.	Rank.	Remarks.
A. R. Neale	Assistant Horticulturist, Prince Rupert	Taking up general farming in the Kootenays.
J. H. McCulloch	District Agriculturist	Newspaper-work at Winnipeg.
W. E. McTaggart	Prairie Fruit Markets Commissioner, Calgary	Newspaper-work at Winnipeg.
A. H. Thornber	Assistant Horticulturist, Victoria	Experimental Sub-station, Corvallis, Montana.
S. H. Hopkins	Assistant Live Stock Commissioner, Victoria	Instructor in Elementary Agriculture, Education Dept., Duncan.
R. M. Winslow	Provincial Horticulturist	Private business.
J. R. McLennan	Editor, *Agricultural Journal*, Victoria..	Newspaper-work at Vancouver.
H. E. Walker	District Agriculturist, Prince Rupert..	Superintendent, Experimental Farm, Killarney, Man.
G. H. Stewart	Accountant, Victoria	Royal Flying Corps, Toronto, Ont.

Roll of Honour.—During the year officials of the Department were grieved to hear of the death of Captain F. Norman Payne, who had enlisted in 1915 with the 2nd C.M.R., and after training in England proceeded to Mesopotamia, where he went through the campaign for the relief of Kut-el-Mara and the capture of Baghdad. His death from cholera at the latter place was reported in November.

The death was also reported through the press of Lieutenant Bernard Shipton, who died of wounds in France. He had also enlisted with the 2nd C.M.R. and won the Military Medal, while the Military Cross was awarded to him after his death.

Flight-Lieutenant Charles Rayner had been an Assistant Inspector with the Inspector of Fruit Pests from the years 1911 to 1914 and was regarded as a very promising official. Enlisting in 1915, he soon obtained a commission and changed to the Royal Flying Corps. He met his death late in 1917.

Temporary Staff.—Following the usual procedure, a number of appointments of temporary officials were made, in addition to the temporary officials already employed, in connection with such matters as inspection of orchards, inspection of fruit at ports of entry, judges at fall fairs, etc. The total number of these appointments during the year was 109, as compared with eighty-three in 1916, these appointments being about equally divided between Provincial expenditure and that under the "Agricultural Instruction Act." (Appendix No. 18 will show the nature of the appointments.)

CORRESPONDENCE.

The correspondence has again shown a slight upward tendency; the total number of letters received during the year being 21,430, as against 20,897 in 1916. Letters dispatched showed a considerable increase over 1916, the figures being 24,952 and 21,856 respectively. The general increase in the inward letters was those due to the Live Stock Branch, whilst the letters sent out from the Deputy Minister's office during the year again constitute a record, being 45.4 per cent. of the total number dispatched.

Circular Letters.—The total number of circular letters sent out was 32,040, as against 46,680 in 1916. These letters were divided under eleven headings, as per attached statement. The decrease in the number due to a larger number of individual letters being sent, and also the lessened activities of Farmers' Institutes and Agricultural Associations.

Agricultural Associations	1,135
British Columbia Dairymen's Associations	965
British Columbia Fruit-growers' Associations	4,950
Horticultural Branch	4,100
Farmers' Institutes	5,780
Miscellaneous	1,005
Poultry Division	6,850
Publications Branch	1,025
Statistical Branch	1,380
Soil and Crop Division	3,700
Women's Institutes	1,150
Total	32,040

Publications issued during 1917.—(*See* Appendix No. 20 for detailed statement.)

New Publications.—Less bulletins and circulars have been issued during 1917 than in previous years, owing to the large stocks carried forward; the total editions of new bulletins, circulars, and miscellaneous publications amounting to 88,400 copies. The *Agricultural Journal* was published throughout the year, with an average circulation of 4,000 copies per month. (*See* Appendix No. 20 for full list of publications.)

Bulletins and Circulars dispatched during the year.—The actual number of publications dispatched by mail during 1917 was 115,811, including the copies of the *Agricultural Journal*. Information dealing with poultry was much in demand and publications on the subject of general farming. (*See* Appendix No. 21 for full list.)

FINANCIAL.

The financial appropriation for this Department totalled $208,002, as against $251,996 for the previous fiscal year, the chief reduction being in grants made to various associations, sup-

pression of noxious weeds, etc. (Appendix No. 22 will give a summary of the appropriations compared with those in previous years.)

During the year a special warrant of $7,000 was obtained by Order in Council for stocking and operating the Frondeg Farm, on Vancouver Island, which had been turned over to the Government of the Province by Griffith Hughes, rent free, for a period of five years.

"*Agricultural Instruction Act.*"—Instalments were again received from the Federal Governments as follows:—

January 19th, 1917, second half of 1916-17 grant	$31,866 25
August 6th, first half of 1917-18 grant	34,599 63
Total	$66,465 88

As stated previously, a large number of temporary appointments of Inspectors and Instructors were made possible by the moneys provided under this Act.

The annual increase for the period 1917-18 was $5,466.56. This, however, was offset by the grant to the Education Department on account of elementary instruction being increased from $15,000 to $20,000.

The number of vouchers issued during the year was 1,248. The number of cheques from the special account at the Canadian Bank of Commerce was 1,261. The total number of Provincial vouchers issued during the year was 2,498, making a grand total of 3,746 vouchers issued. (*See* Appendices Nos. 23 and 24 for sections of the "Agricultural Act, 1917-18," and for details of vouchers issued.)

Seed-grain distributed in 1915 and 1917.

Year 1915.—Payments from Government Agents responsible for the collection of promissory notes given by settlers in 1915 have come in but slowly during the year, the total amounts collected being $1,108.92, leaving a balance of $5,782.15, distributed as follows:—

Government Agent at Fort Fraser	$ 57 80
" " Cranbrook	626 14
" " South Fort George	300 42
" " Greenwood	129 00
" " Vernon	1,203 88
" " Nelson	165 93
" " Kamloops	1,444 05
" " Vancouver	1,854 93
Total	$5,782 15

The Government Agents reported that many of the parties who were supplied with seed-grain have gone overseas, whilst a few have left the Province for other parts of the Dominion, so that unless a special effort is made by legal process to recover the amounts due there will probably be a large deficit.

Year 1917.—Representations having been made to the Government that settlers in the area of Tete Jaune Cache and Hazelton were so situated financially, owing to the failure of the harvest in 1916, that they were unable to provide seed for the 1917 crop, Orders in Council were accordingly passed as follows:—

January 8th, 1917	$ 3,000
February 26th, 1917	7,000
Total	$10,000

The Department officials at once took the matter in hand, seed-grain to the sum of $7,031.07 being purchased and distributed along the line of the Grand Trunk Pacific Railway promptly. Freight and handling charges amounted to $1,488.11, making a total cost of this work $8,519.18. Promissory notes did not fall due until December 31st, 1917. Indications are that prompter payments will be made than in connection with the year 1915.

British Columbia Students.

Owing to the University of British Columbia now providing a first-year's course in agriculture, the number of students leaving the Province for Eastern colleges to take up such work

has decreased considerably, and the Honourable Minister of Agriculture has made a ruling that no grant will be made to British Columbia students who commence an agriculture course outside the Province, but the grants will still be made to students who wish to take a second- or third-year course or full graduation at Eastern colleges. The names of the students for the year 1917 are as follows:—

Ontario Agriculture College.—Spring term, 1917: First year, Cecil C. Evans, Mary Gertrude Steele, Mildred E. Ruttan, Arthur Jas. Mann, Herbert Butters, and Geo. Patchett; second year, Miss Mabel A. Witmer; third year, Harold L. Davis; fourth year, A. H. White and Oliver C. Evans. Fall term, 1917: First year (no grant), Charles James Butt; second year, George Patchett; third year, George Knowles; fourth year, Leslie Harold Davis and Arthur James Mann.

Manitoba Agriculture College, Winnipeg.—Spring term, 1917: First year, Donald Budge; second year, Ross MacKinnon; fourth year, David W. Robertson. Fall term, 1917: Course in Agriculture, D. W. Robertson and R. E. Wells; Course in Home Economics, Miss Gladys E. Halliwright and Miss Florence M. Elliott.

Macdonald Institute.—Fall term, 1917: Home Economics, Associate Course (two years), Miss Gundrid M. Rebbeck.

University of Toronto.—Fall term, 1917: Household Science Course, Miss F. L. Fullerton.

HORTICULTURAL LICENCES.

Thirty-nine horticultural licences of principals and agents were issued during the year, as against thirty-five in 1916. These were made up as follows:—

Principals, nurserymen, foreign and British Columbia	22
Agents, nurserymen, foreign and British Columbia	17
Total	39

A good feature of the year's work has been the establishment of a nursery by one of the firms who had the majority of the importation-work. Energetic action was taken by the Horticultural Branch and the Provincial police in connection with possible infractions of the Statute, but there are several cases of nurserymen who claim their business does not justify them putting up the $25 necessary for a bond and licence.

BEE-INSPECTION WORK.

Following the procedure in previous years, temporary appointments of Inspectors were made to inspect the apiaries of the Province and give advice and practical demonstrations. The season of inspection lasted from April 18th to August 31st. F. D. Todd, of Victoria; L. Harris, of Vernon; and W. J. Sheppard, of Nelson, were again employed for the districts covered by them in 1916. The expense of this work was borne from a special section of $2,500 provided in the "Agricultural Instruction Act, 1917-18." Compensation was again paid to owners of hives whose premises had been inspected and condemned on account of the presence of foul-brood, a total sum of $312.85 being expended in this connection.

AGRICULTURAL FAIRS ASSOCIATIONS.

For the first time for many years no new associations were incorporated during 1917. Owing to the necessity of economy no annual convention was called by the Department, but arrangements for dates of fairs were made by correspondence, the associations being circularized as to the most suitable dates and the final decision left to the Department.

Although some fifty-six fairs were originally arranged, forty-eight were finally held; forty-three of these being by incorporated associations, four by Farmers' Institutes, and one by a Horticultural Society. (For details of dates and places *see* Appendix No. 25.)

Judges.—Thirty-seven staff and outside judges were supplied by the Department to Fair Associations, as against thirty-nine in 1917.

The following statement shows appointments for years 1916-17:—

Judge.	1917.		1916.	
	Staff.	Outside.	Staff.	Outside.
Live stock and dairy products	2	11	7	9
Poultry	2	6	2	6
Fruit and vegetables	11	2	11	3
Honey, etc.	...	3	...	1
Totals	15	22	20	19
	37		39	

Reports sent in by judges were, on the whole, encouraging, especially those from the poultry judges; the improvement in the number of entries of birds and the excellent condition of same being very noticeable. Generally speaking, however, the displays of fruits and vegetables were good in quality, but were lacking in quantity; this being partly due to the shortage of labour preventing exhibitors from preparing exhibits and attending fairs, and also to the rather dry season experienced. There is no doubt, however, that the determination of districts to continue holding these fairs during war-time is a good one. A special feature of the fair season was the sending round of pathological exhibits to Duncan, Victoria (Home Products Fair), Coquitlam, Langley, Kelowna, Grand Forks, Nelson, and Summerland. These exhibits drew attention to the various diseases affecting horticultural products, and J. W. Eastham, Plant Pathologist, and his Assistant, M. H. Ruhmann, were in attendance to give explanation and advice.

Financial.—The appropriation for Fair Associations was $20,000, of which $12,850 had been awarded in grants in aid of prize-lists. (*See* Appendix No. 26 for details.)

FARMERS' INSTITUTES.

The total number of institutes existing at the end of the year was 148. There were five new institutes organized in 1917, whilst three—Vargas, Okisollo, and Nitinat—were temporarily closed down during the continuance of the war. The new incorporations were as follows: January 10th, Houston Farmers' Institute; January 25th, Westside Okanagan Farmers' Institute; February 6th, Trapp Lake Farmers' Institute; March 19th, Roe Lake Farmers' Institute; May 7th, Similkameen Farmers' Institute.

Several institutes have lost so many members that they may be regarded as dormant during the continuance of the war, and no grants were possible to those whose membership was below fifteen. The total membership recorded for the year was 6,194, as against 6,974 in 1916. The institutes with the largest membership were as follows:—

Creston	232
Spallumcheen	192
Francois Lake	137
Nanaimo-Cedar	130
Delta	129
Cowichan	119
Martin's Prairie	119
Surrey	108
Bella Coola	97
Northern Okanagan	94

The Advisory Board of Farmers' Institutes met at Victoria in February and dealt with the resolutions submitted to the Department. District meetings were also held in the Okanagan and Kootenay Districts, and the Department is now perfecting a scheme of grouping all institutes into nine districts corresponding with the electoral districts of the Province, and a new Advisory Board will be appointed in accordance with the 1917 amendment to the "Agricultural Act, 1915."

Financial.—The Estimates for 1917-18 reduced the institute vote to $15,000, the total expenditure at the close of the calendar year being $12,633.02, as shown in Appendix No. 27. The total cost of a Farmers' Institute to the Department was $85.36, as against $103.35 in 1916-17.

Short Course and Lectures.—The programme for the winter meetings comprised forty-two institutes in the itinerary, the period extending from February 16th to March 17th. (*See* Appendix No. 28 for full list.)

A short course in general agriculture and horticulture was again arranged to be held from February 5th to 16th. The subjects dealt with were live stock, breeds and management; feeding stock; cattle-diseases and first aid; succulent crops; field crops; forage-crops; soil-treatment; vegetable-growing; potatoes, varieties, etc.; fertilizers; orchard insects, insect pests, plant-diseases, sprays, etc. Demonstrations were given in poultry and in dairy and live-stock judging. The co-operation of the British Columbia University was very heartily appreciated.

The lecturers included the following: Professor J. A. McLean, Professor P. A. Boving, Dr. A. Knight, H. O. English, T. A. F. Wiancko, J. R. Terry, M. S. Middleton, B. Hoy, and J. W. Eastham.

The interest evidenced and the attendances, however, were rather disappointing, both at the short course and at many of the institute centres.

Fairs held by Farmers' Institutes.—In 1917 only four institutes held fairs, as against seven in the previous year; the dates were as follows: Evergreen (San Josef Bay), September 13th; Cape Scott, September 17th; Denman Island, September 18th; Rock Creek, October 26th; Pouce Coupe. The Department again sent judges to the first four by special request.

WOMEN'S INSTITUTES.

During the year only one new institute was organized, this being the Tillicum Women's Institute on December 29th. The total membership for the year was 2,754. The following table will show comparison with the two previous years:—

	No. of Institutes.	Membership.
1915	56	2,994
1916	60	3,039
1917	61	2,754

In the early part of the season membership returns were so encouraging that it looked as though, in spite of the decreased population in the Province, membership records would again be broken. At the time of this report annual returns from institutes are still coming in, and it is not possible to give a full account of the activities of same, but extraordinary efforts have been made during the year in raising funds for patriotic purposes. The total value of cash contributions by Women's Institutes to various patriotic organizations exceed $16,000, whilst some 21,000 articles were sent overseas. (*See* Mrs. Davies's report for details.)

The institutes with the largest membership during the year were as follows:—

Kelowna	185
Cowichan	167
Cranbrook	138
Penticton	105
Creston	98
Shawnigan and Vernon	79

The average membership for all institutes was forty-five, as against fifty-one in 1916.

Financial.—The Department again secured the vote of $7,500 for Women's Institutes, including educational work, for the fiscal year ending March 31st, 1918. The total actual expenditure on this work was $8,742.03 for the calendar year, the average cost of an institute having risen to $148.17, as against $104.28 the previous year. (*See* Appendix No. 29 for full details.)

Conferences.—District conferences were again held as in 1916, as follows: Okanagan District, at Vernon, September 18th to 20th; Kootenay and Boundary District, at Cranbrook, September 25th to 27th; Vancouver Island, at Duncan, October 3rd to 5th; Lower Mainland, at Mission City, October 11th and 12th.

These conferences were run in a very business-like manner. A large number of resolutions dealing with women and children were submitted to the Department at the close of the year for

action. Only actual expenses of official delegates were paid by the Department; the institutes in several cases bore the expense of one or more delegates themselves.

Lectures and Demonstrations.—Mrs. J. S. Chalmers, of Thrums, B.C., continued her lecture-work to the institutes which she had not visited at the close of 1916. Her third, fourth, and fifth itineraries took up her whole time from January 5th to May 2nd.

There has never been such a highly successful series of lectures and demonstrations to institutes provided by the Department before. Mrs. Chalmers won golden opinions from every district she visited, and there is no doubt her practical advice and clear demonstrations have stimulated interest, not only amongst the Women's Institutes, but also in many cases of the farmers of each district.

Flower-shows.—Forty-one institutes held flower-shows and were paid the grant for same, as against forty-three in 1916. The Department was not able to appoint horticultural judges from the staff, as had been done previously, owing to being short-handed. From reports received, however, both the financial and social sides of these events were very satisfactory. (*See* Appendix No. 30 for list of dates.)

Competitions, Year 1916.—These competitions were not decided until rather late in 1917, the winners being as follows:—

(*a.*) Best Average Attendance at Meetings based on June Membership.—First prize (books, $20), Upper Sumas, 77 per cent.; second prize (books, $10), Gordon Head, 74.4. Next in order of merit: Nakusp, 74.3; Crawford Bay, 68.4; Robson, 66.8; Lake Hill and Mission, 66.6; Cranbrook, 64.9; Penticton, 60.7; Harrop, 60.3.

(*b.*) Programme Competition.—First prize (books, $15), Salmon Arm; second prize (books, $10), Nelson. Next in order of merit: West Saanich, Haney, Chilliwack, Agassiz, Surrey, Naramata, West Summerland, Hazelmere, Summerland, and Langley.

(*c.*) Essay Competition.—First prize ($10), Mrs. Henry Calhoun, Tappen Institute (subject, "Reading-matter for the Home"); second prize (specially raised to $10 on account of merit), Mrs. E. H. Lock, Summerland Institute (subject, "The Importance of Vocational and Technical Training"); third prize ($5), Mrs. A. John Grigg, Vice-President, Nakusp Institute (subject, "Economics in the Home"). Specially mentioned: Mrs. E. L. Winson, Upper Sumas Institute (subject, "Reading-matter in the Home"); Mrs. V. S. MacLachlan, Garden City Institute (subject, "Economics in the Home.")

(*d.*) Competitions for Junior Members.—No prizes awarded.

The programme competition attracted a large number of competing institutes, and the first twelve were all excellent and deserving of note.

The competitions for 1917 follow similar lines, institutes having been given to March 31st, 1918, to send in essays and other matter.

General.

The new scheme of allowances authorized by the 1917 amendment to the "Agricultural Act, 1915," whereby the Department paid a $1 *per capita* grant for each first fifty members of an institute who paid a like amount, has resulted in a larger sum being paid to institutes, although many of the latter have written in hoping that the Secretary's allowances, which had been discontinued, would be revived. Owing to the activity of institutes, supplies of stationery, books, etc., now amount to a considerable annual charge, the same having risen from $190.86 to $1,257.94 in 1917.

An interesting feature in the year's work was the holding of a "better babies" contest on August 1st by the Garden City Women's Institute. The institute year has been one of intense activity, each institute vying with the other in its output for material for the Red Cross and other patriotic societies in connection with the Great War.

Noxious Weeds.

No special vote for the suppression of noxious weeds was provided in this year's Estimates, and work of this nature was delegated to Provincial constables, acting as agents for the Department, whilst an Order in Council was approved on June 3rd appointing all District Forest Rangers and Assistant Rangers of the Forest Branch to be Inspectors under the "Noxious Weeds Act." Full reports are not yet to hand, but the expenditure in cutting noxious weeds on absentee-owner property has only amounted to about $500. It is probable that agriculturists

and owners of property who are interested in increased production are taking greater care to look after the land, and the vigorous campaigns conducted by this Department in 1914, 1915, and 1916 are also bearing fruit.

All of which is respectfully submitted.

WM. J. BONAVIA,
Secretary.

ANNUAL REPORT OF STATISTICS BRANCH.

A. B. TWEDDLE.

Wm. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit my annual report on the work of the Statistics Branch during the year 1917.

SCOPE.

With the beginning of the current fiscal year, supervision of the work of this Branch was assigned to your present Statistician.

In scope, the work was much the same as during the previous five years—that of collecting data relating to agricultural production, imports and exports—but methods varied in part.

During the three years 1914-15-16 the plan used in collecting information respecting production was by personally visiting as large a number of representative farmers as possible. The scheme adopted in 1917 was in accordance with one of the many recommendations submitted in 1912 by a Commission to inquire into the statistics of Canada, appointed by the Federal Government. This recommendation was that statistics relating to agricultural production in Canada be collected annually and by joint effort of the Federal and Provincial Governments, thereby doing away with much duplication of effort and conflicting results. This recommendation was strongly endorsed by a conference consisting of representatives of both the Federal and Provincial Governments and held at Ottawa in 1914 for the purpose of informal discussion of statistical matters in the light of the report of the Commission. As a result of the understanding of this conference, a scheme was drafted by R. H. Coats, Dominion Statistician and Controller of Census, for the collection of statistics relating to crop areas and live stock in 1917, and which was adopted by the Provinces of Quebec, Manitoba, Saskatchewan, Alberta, and British Columbia.

This scheme provided for the mailing of card schedules direct from Ottawa to all agriculturists in this Province whose names appeared on the Provincial voters' lists of 1916. Returns were required to be forwarded to this Department and there compiled.

RESULTS OF 1917 METHOD.

Some 19,300 cards were distributed in British Columbia. About 4,300 were returned through the Dead Letter Office owing to "enlistment," "dead," "removed," etc., whilst approximately 7,000 were duly filled out and forwarded to this office, which represents 46 per cent. of the estimated number of actual farmers in the Province at that time.

Considering an initial experiment, this may be accepted as a very satisfactory response, and is the second highest percentage secured by any of the Provinces where this scheme was adopted.

The time available for the completion of details of this plan prior to putting same into operation on the scheduled date was limited, thus rendering impossible the necessary campaign. However, with improved details, an up-to-date mailing-list, an effective campaign toward educating farmers in the importance of statistics, and which has already been started through the medium of the Department journal, future results will undoubtedly prove much more satisfactory.

By the adoption of this method and its operation with clear definition, the collection of statistics will not only be placed on the most economical basis, but results will form a sound basis on which to determine annual progress of the agricultural industry.

Comparative Results, 1916 and 1917.

Comparing results of the 1917 method with those of the previous year, when only general information could be obtained, it is noted in the case of the total area of grains that the 1917 figure was 0.5 per cent. and that of fodders and roots 9 per cent. higher. In numbers of live stock, however, the 1916 estimates were apparently too optimistic, being from 2.6 per cent. in the case of dairy cattle to 15 per cent. in that of horses higher than the 1917 results show, and which demonstrates clearly the impossibility of determining the numbers of live stock by any means except a census. Many farmers may have a fairly reliable knowledge of crop areas, but in the majority of cases they know little about live-stock progress.

Crop Correspondents.

For the purpose of obtaining information from time to time relating to crop conditions, yields, values, etc., some 200 farmers, Secretaries of Farmers' Institutes, and Department officials were asked to submit periodical reports to this office, whilst the Federal office appointed an equal number who were asked to report to that office. Separately compiled results from these two sets of correspondents were then exchanged by these two offices, and the average result, mutually agreed upon, adopted and published.

Imports and Exports—Collection of Data.

In the continued absence of data from the transportation companies relating to the volume of interprovincial trade, particularly inward movements, the same method which has been in use since 1914 was adhered to—viz., the collection of the required data from the chief wholesale establishments within this Province. Forms were mailed to over 500 establishments, asking for a return of the total quantity and value of Canadian food products imported from all the other Provinces during the year. Results have not been as satisfactory as desired, since only about 50 per cent. responded, but which is doubtless partially due to the prevailing shortage of clerical assistance. With the data secured in former years, it will, however, be possible to determine fairly well the year's imports into the Province. Export data are being supplied by the various shippers, Department officials, and transportation officials.

Publications.

During the year the annual statistics bulletin for the year 1916 was compiled and published; also three circular bulletins containing results of the various crop returns, these latter being distributed amongst the various newspapers, farm journals, etc., for publication.

Statistical articles were supplied from time to time to the departmental journal.

Cost of Production.

Through the efforts of the Soil and Crop Division, data relating to the cost of producing certain field crops have been collected in recent years. It became desirable that such data should be extended to include all crops, as well as live stock, and these, to begin with, based upon a complete inventory of the farm. By mutual arrangement with the Soil and Crop Division, the work already being conducted under its supervision was surrendered to this Branch.

It is planned to begin this work the first of February next, and the necessary details are now nearing completion. These include the selection of about 400 carefully chosen farmers who will undertake the necessary recording for one year along the lines of forms and diaries now being printed.

Similar work has been carried on in some sections of the United States for the past fifteen years, and at the outset results proved very valuable, not only to farmers in particular, but administrators as well. To those farmers taking up this work the benefits will soon be manifest by showing the economic status of the farm, and serving to stimulate greater interest in better management, whilst the data made available in compiled form to this Department should prove a valuable basis in fostering the welfare of farmers generally.

Consumption per Capita.

During the past year an effort was made to secure data relating to the *per capita* food consumption in this Province. Returns including some 500 persons of all ages were obtained

and compiled, and results are very interesting. This work was conducted as an experiment, but results warrant further effort on a more comprehensive plan to include city as well as rural consumers, the latter only being considered so far. Results are intended for the purpose of determining total food requirements of this Province, as well as surplus supply. While there are data relating to other countries, these do not necessarily apply to this Province, and it was therefore considered advisable to establish our own basis.

OFFICE-WORK.

Owing to the method of collecting statistics by mail in 1917, the time of your Statistician was necessarily largely spent in the office compiling returns and issuing reports. The editing of the annual report of the Department was also undertaken.

STATISTICS RELATING TO AGRICULTURAL PRODUCTION, YEAR 1917—PRELIMINARY ESTIMATE.

While the following summary is merely intended as a preliminary estimate of production during the current year, since returns are yet incomplete, it nevertheless will serve as an indication when compared with that of 1916.

Figures relating to live stock, meats, poultry, and dairy products may be accepted as approximately correct, but those of fruits, fodders, and grains are subject to more or less revision, pending more complete returns. Vegetables for the time being are not considered.

Owing to unfavourable crop-growing conditions and the fact that the year's postal census of live stock revealed that our previous estimates were over-optimistic, it was not anticipated that there would be any material increase shown in the total value of the 1917 production. Notwithstanding decreased production in live stock, mutton marketed, poultry and eggs, fodders, grains and hops, prices of these and all other products which obtained throughout the year were sufficiently high to more than offset this effect.

The total value of all products except vegetables, when compared with the value of the same products in 1916, shows an increase in the current year of approximately $2,125,000, or nearly 7 per cent. The increase in the total value of all products in 1916 over 1915 was 3.39 per cent. While it is desirable not to set down a definite figure of the total value this year, in the absence of returns relating to vegetables, yet it is reasonable to expect that this figure will approach the $34,000,000 mark, as against $32,182,915 in 1916.

Live Stock.—With the exception of those of dairy cattle, prices have averaged 10.7 per cent. for horses, 14 per cent. for beef cattle, 15 per cent. for sheep, and 10 per cent. for swine, higher than 1916. The total value of the year's production of live stock is estimated to be $8,632,137, or 0.8 per cent. less than 1916.

Meats.—The quantity of British Columbia beef marketed in 1917 was 10 per cent. greater than 1916, and that of pork 34.5 per cent. greater. Mutton shows a reduction of 5 per cent. The total value of all meats marketed is estimated as 26.2 per cent. greater.

Poultry and Eggs.—These both show a production during the year of 10 per cent. less than 1916, but 2.7 per cent. greater in value.

Dairy Products.—Production in quantities is estimated to be about the same as in the previous year, but in value 15.7 per cent. greater.

Fruits.—Whilst conditions were unfavourable to normal maturity in size, particularly of apples, thus reducing total production from early estimates, yet it is estimated that the total quantity of all fruits was about 5 per cent. greater than 1916. Reports from the Okanagan District show marked increases in shipments. Prices throughout the Province have averaged about 18 per cent. more than 1916.

Potatoes.—In showing an increased production in this crop, it is necessary to point out that only commercial areas were included in the 1916 estimate, whilst in 1917 city-garden and other small plots were included, thus showing the total to be 18.2 per cent. greater in quantity than the previous year, and 7.7 per cent. greater in value.

Fodders.—These crops show increases in both quantity and value, being 6.7 and 16.8 per cent. respectively.

Grains.—These important crops probably suffered most from unfavourable growing conditions, the spring being backward and drought during the period of maturity being excessive. Total quantities were reduced 20.2 per cent. below the previous year. Prices were such, however, that the total value is estimated to be only 3.4 per cent. below 1916. It is interesting to note

that the quantity of grains produced (in terms of bushels) in this Province in 1917 shows a decrease of over 45 per cent. since 1915.

Honey.—Reports at hand indicate that the crop of honey will be 33.3 per cent. more than 1916, and values 40.4 per cent. greater.

Hops.—The greater relative reduction occurring in any one crop was in hops, this being 76.2 per cent. below 1916. This was due to the removal of a large percentage of the area. The total value was 48.3 per cent. less.

Respectfully submitted.

A. B. TWEDDLE,
Statistician.

ANNUAL REPORT OF FOUL-BROOD INSPECTOR, LOWER MAINLAND AND VANCOUVER ISLAND.

F. D. Todd.

Wm. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit my annual report on the work conducted in the above districts during the year 1917.

Season.

Owing to wretched weather it was not until April 18th that your Inspector was able to start on his seventh season's service as a Bee Inspector for the Province. On arriving in Vancouver and getting into work in the field, it was very soon learned, as was expected, that the winter had been a very trying one, and that about 40 per cent. of the colonies in the district had died during the winter. In most winters in British Columbia, bees do well without any protection, the result being that the majority of bee-keepers are willing to take a chance, with direful results as a consequence in the severe ones. However, the beginners in bee-culture as a whole are now handling their bees on the principle of safety first.

Activities.

Until the end of June activities were confined chiefly to the region extending from New Westminster to the mouth of the Fraser River, in which there are about 450 bee-keepers. Early in July a series of demonstration meetings was started along the north bank of the Fraser, then up the west coast, across to Comox, and southward on Vancouver Island to Nanaimo. In the first week of August lectures were given on bees and demonstrations to the school teachers in the summer school at Victoria. The rest of the month demonstrations were given between Chilliwack and Vancouver, on the south bank of the Fraser.

Disease.

In the beginning of September a new outbreak of American foul-brood was discovered in the River Road district of Burnaby, traceable to a hive brought from South Vancouver in 1912 or 1913. About the same time there appeared the first case of European foul-brood in the Lower Fraser region. This outbreak was probably due to the affected honey attached to the woodwork of a honey section from Idaho, on which the bee-keeper found his bees busy early in the season. The user, after cutting out the honey, had flung the woodwork out-of-doors. As far as could be judged, this was an illustration of the way in which practically all our outbreaks of foul-brood originate. British Columbia in 1917 has become practically self-supporting so far as extracted honey is concerned; in another year she will probably be entirely so, after which the chance of new infection will be confined to imported section-honey. As the demand for section-honey is rapidly lessening every year, the present prospect is that bee-keepers will soon confine themselves to the production of extracted honey, thereby minimizing the chance of the introduction of foul-brood to our Province.

Your Inspector is glad to report that the outbreak of foul-brood discovered in his district in 1914 is now well in hand. Five municipalities—Vancouver, Point Grey, Coquitlam, Chilliwack, and Nanaimo—in which it had a footing are apparently clear. It still lingers a little in South Vancouver, and has appeared in Burnaby.

CROP.

In 1917 the honey-crop in your Inspector's districts was by far the largest in its history. Once acquainted with apicultural conditions in the Province, an endeavour was made in 1913 to estimate our crop in 1910, the year before the Bee Inspectors began this work. Twenty tons was the highest total which could be arrived at. The 1917 crop is indicated to be 160 tons, an increase of 700 per cent. in seven years. The Coast region apparently produced 120 tons.

The outlook for 1918 is very encouraging. The winter stores are excellent, the hives are filled with young bees, and the Province has a fine band of enthusiastic new bee-keepers whose heart is in their work, so with a favourable season it would not be surprising if the crop of 1918 nearly doubled that of 1917. With sugar conditions as they are, this result is devoutly to be wished for.

Respectfully submitted.

F. DUNDAS TODD,
Foul-brood Inspector.

ANNUAL REPORT OF FOUL-BROOD INSPECTOR, OKANAGAN AND THOMPSON RIVER DISTRICTS.

L. HARRIS.

W. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit my annual report of bee-inspection work in the Okanagan and Thompson River Districts for the year 1917.

The season was the most backward experienced during the ten years your Inspector has lived in the Okanagan District.

SEASON.

The result of the late, cold, and backward spring had a very injurious effect on the bees generally, in that they were unable to breed as early and continuously as in an average season. As a consequence, a great many colonies that survived the actual winter dwindled away from lack of young bees to take the place of the old ones that died, the result being that the losses for the winter of 1916-17 were above the average, being about 45 per cent. In a few cases where the owners took the precaution to re-queen in late summer, the results were very different and most satisfactory.

Following the late spring, and the bees generally in a backward condition, they were not ready to take advantage of the honey-flow season, which both came and ended suddenly, including not more than ten days as far as storing surplus goes, the result being that in this district the honey-crop was not an average one.

In the Thompson and Fraser River Districts better conditions prevailed, and in some cases quite a satisfactory crop was secured.

FOUL-BROOD.

There appears to be a distinct improvement in the foul-brood situation, eight colonies only having been found diseased throughout the district.

EXHIBITS.

Several displays of honey and bee products were staged at the different fall fairs, which proved an agreeable attraction, especially at the Vancouver Exhibition, where the bee-keepers of the Province met together in competition for valuable prizes.

ORGANIZATION.

On Friday during the exhibition week the bee-keepers met in convention, and the different problems of the bee-keeper were freely discussed. It was thought desirable that the whole of the Province should form itself into one organization, with central headquarters at Vancouver.

It was proposed to divide the Province into four districts, as follows: No. 1, Vancouver Island; No. 2, Coast; No. 3, Okanagan; No. 4, Kootenay; with an executive for each district. This body was to consist of one delegate for every ten members, and to be elected by the members

of each district; each district to be entitled to send two delegates to the central organization, to represent their respective district for general and special business. How this will work remains to be seen.

Respectfully submitted.

L. Harris,
Foul-brood Inspector.

ANNUAL REPORT OF FOUL-BROOD INSPECTOR, KOOTENAY AND BOUNDARY DISTRICTS.

W. J. Sheppard.

Wm. E. Scott, Esq.,
Deputy Minister, Department of Agriculture, Victoria, B.C.

Sir,—I beg to submit my annual report on the above work for 1917.

Crop.

The past season, although not quite equal to that of 1916, was a successful one for the bee-keepers in this territory, there having been a good yield of excellent honey, quite up to the usual standard. The exceptionally dry summer had the effect of considerably curtailing the period of honey-gathering by the bees, as, owing to the prolonged drought, the clovers and other nectar-secreting flowers did not remain in bloom as long as usual.

Winter Loss.

The losses during the winter of 1916-17 here averaged about 25 per cent., and in many instances were caused by honey-dew stored by the bees in the brood-combs during the preceding fall. In 1917 honey-dew seems to have been almost entirely absent. The bee-keepers have not worried much over their winter losses, as they have been able to ship in bees in 2-lb. packages from California at a cost delivered of about $4 per lot. These little colonies have done remarkably well, 100 lb. and upwards of honey having been secured from many of them, thus paying for their cost several times over.

Demonstrations.

Your Inspector gave demonstrations in bee-keeping to the following Women's Institutes, in accordance with your directions: Willow Point, Greenwood, Creston, Nakusp, Arrow Park, Crawford Bay, and Rock Creek, and also to the Robson Farmers' and Junior Farmers' Institutes. Nearly all these meetings were well attended and much interest was shown by those present.

Demonstrations were given at apiaries visited in the use and construction of a simple form of hive-case which appears to be well adapted for both summer and winter conditions in this territory. Its use will no doubt tend to reduce winter losses and help to keep swarming in check, thus increasing the honey yield.

Experiments.

Experiments have been carried out in your Inspector's personal apiary in Nelson in new methods for swarm-control, the production of sections, etc., the results of which promise to be of value to the bee-keepers in this territory.

Bees in Orchards.

The fruit-growers are realizing the importance of keeping bees in their orchards. The short fruit-crop this past season has been attributed by many to the almost total absence of wild bees and other pollinating insects during the blooming period, caused no doubt by the late cold spring, which is generally fatal to wild-insect life.

Honey Sources.

White clover continues to spread in this territory, especially where cattle are allowed to range, and farmers are growing more alsike. Some of the bee-keepers who have land available are trying sweet clover (*Melilotus alba*), which not only yields honey in quantity, but has been found to be a good forage-plant that will withstand drought and improve the soil. One or two are also experimenting with sainfoin, which is a good honey-plant.

FOUL-BROOD.

Foul-brood was found in two apiaries—viz., at Kaslo and Nelson—and the colonies affected were destroyed.

Respectfully submitted.

W. J. SHEPPARD,
Foul-brood Inspector.

ANNUAL REPORT OF SECRETARY, ADVISORY BOARD OF WOMEN'S INSTITUTES.

MRS. M. S. DAVIES.

Wm. E. Scott, Esq.,
Superintendent of Institutes, Department of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith my report on the work of the Women's Institutes for the year 1917.

During the year one institute was organized at Okanagan Centre and Woods Lake, Okanagan Valley, making a total of fifty-nine institutes now in active work, with a membership of nearly 3,000.

The membership reported for 1917 is a little less than in 1916. In many sections members have moved away, and others have become absorbed in patriotic societies.

FLOWER-SHOWS.

These have been held by thirty-nine institutes. The prize-lists were comprehensive, in many cases including early vegetables. The quality of exhibits was excellent. Many institutes have a department for needlework and one for cooking. More attention should be given towards interesting children in gardening and taking part in these exhibitions.

The Department assisted each show with a *per capita* grant of 25 cents and five book prizes.

PROGRAMMES.

Forty-five institutes carefully prepared their yearly programmes, the majority having these printed for distribution, while others economized—having typewritten or written copies for members. The topics show a wider range of study than formerly.

CONFERENCES.

During the year conferences were held in the four institute districts, as follows: Okanagan, at Vernon, September 18th to 20th; Kootenay, at Cranbrook, September 25th to 27th; Vancouver Island, at Duncan, October 3rd to 5th; Lower Mainland, at Mission City, October 11th and 12th.

The delegates greatly appreciated the presence of our Superintendent of Institutes at the first three of these conferences. Professor Davidson, of the University of British Columbia, gave splendid addresses on "The Wild Flowers of British Columbia," and Mrs. Chalmers gave helpful talks on "Food Conservation"; these two speakers illustrated their lectures with lantern-slides.

At the two Coast conferences Dr. Young, Secretary of the Provincial Board of Health, added much to the general help given by his address on "Public Health."

The earnest discussion on every paper showed the interest taken by the women in all matters dealt with. A large number of resolutions were brought up, many of which were adopted and forwarded to the different departments for consideration.

LECTURES.

During the winter of 1916 and spring of 1917, Mrs. J. S. Chalmers, of Thrums, visited each of the institutes, giving a two-day course of lectures on vegetable-gardening; live stock on the farm; values of silos; home canning, etc. Judging from enthusiastic reports from the institutes, these lectures were very helpful and much appreciated.

SCHOOL-WORK.

Fifteen of the institutes have School Committees. These committees, by permission of the trustees, visit schools regularly and co-operate with teachers toward improving sanitary and

other conditions of local schools. This helps to bring teachers, trustees, and parents into helpful relationship. The matter of Parent-Teacher Associations was discussed at two of the conferences. Reports show that twenty-one Women's Institute members are working on School Boards. The Kalamalka Women's Institute instituted a Scholarship Fund to assist some student each year who, if successful in the entrance examinations, wishes to prepare for college. The scholarship of $100 was won this year by Miss Winnifred Brown, of Oyama.

Boys' and Girls' Clubs.

These have not been generally formed, only sixteen being reported from three Women's Institute districts. Only one Poultry Club has been reported.

Patriotic Work.

This has been the principal work undertaken in 1917. The institutes raised the splendid sum of $16,824.07 for this purpose, as reported for the conference year. Many have been the special calls upon Women's Institute funds for needed help, and none have been refused.

Military hospitals have been assisted; the Agricultural Relief of the Allies Fund has been generously helped; the Military Y.M.C.A. has perhaps received the greatest contributions, with the exception of the Red Cross, to which $6,490.39 was given, and $2,371.19 to Y.M.C.A.

Among articles made and sent overseas the following have been reported: 6,404 pairs of socks; 2,560 suits of pyjamas; 1,977 shirts; or a total of over 21,000 articles from the institutes.

Publications.

Only two numbers of the "Quarterly Bulletin" were published in 1917, the cost proving greater than expected. A number of pages are given each month to Women's Institute work in the *Agricultural Journal*, thus making Women's Institute news up-to-date, and also making it possible for a greater number of other helpful papers being printed.

Advisory Board.

Owing to the retirement of Miss Ravenhill in January, another member had to be appointed to represent the Island institutes, and Mrs. Blackwood-Wileman, of Duncan, took her place. The resignations of Mrs. Lipsett, of the Okanagan institutes, and Mrs. Davies, of the Lower Mainland institutes, to take place at the close of the year, was laid before the Superintendent of Institutes in the early fall.

The following statement relating to Women's Institutes for the conference year may be noted:—

	Kootenay.	Okanagan.	Vancouver Island.	Lower Mainland.
Membership	669	908	524	804
Junior members	34	11	15	10
Flower-shows	9	11	8	11
Total receipts	$4,890.34	$5,395.15	$3,951.10	$4,389.52
For patriotic purposes	4,069.67	4,462.67	4,239.22	4,052.32
Red Cross	1,159.56	596.10	3,494.89	1,239.84
Prisoners of war	315.68	648.70	363.62	619.20
Y.M.C.A.	159.95	1,914.62	129.90	176.65

The institute-work has steadily grown in interest and efficiency. The members expect by the study of Canadian civics, that many are planning to take up during the coming year, to fit themselves for greater efficiency. Another feature of recent date is the food-conservation pledge cards, and the distribution of these, also the study of food-conservation problems, promises earnest work and planning.

Respectfully submitted.

Mrs. M. S. Davies,
Secretary, Advisory Board.

APPENDICES.

APPENDIX No. 1.

PRUNING-SCHOOLS, 1917.

No.	Place.	Instructor.	Dates.	Pupils.		No. of Lessons.	Instructors.		Total Expenses.	Fees. received.	Net Expenditure.
				No.	Av. Prof.		Salary.	Expenses.			
			1916.		Per Cent.						
1	Summerland	Ben Hoy	Dec. 18-23	7	68.0	10	$ 26.45	$ 16.75	$ 43.20	$ 7.00	$ 36.20
			1917.								
2	Westbank	Ben Hoy	Feb. 20-24	7	68.0	8	24.40	12.25	36.65	7.00	29.65
3	Kelowna	M. H. Chesbro	Feb. 8-16	9	85.5	10	32.10	Nil	32.10	9.00	23.10
4	Naramata	M. H. Chesbro	Jan. 23-26	9	82.0	9	14.30	17.75	32.05	9.00	23.05
5	Nanaimo	H. Thorber ...	Jan. 29-30 / Feb. 26-28	9	72.5	10	23.50	30.55	54.05	9.00	45.05
6	Metchosin	E. W. White ..	Feb. 26- / March 2	8	74.0	10	18.00	15.50	33.50	8.00	25.50
7	Rocky Point	E. W. White ..	Feb. 19-21 / March 5-7	8	79.0	10	21.50	22.50	44.00	8.00	36.00
8	Mission City	H. Thorber ...	March 5-8	5	70.0	8	17.60	16.45	34.05	8.00	26.05
9	Duncan	H. Thorber ...	Feb. 19-20 / March 12-13	6	67.5	7	17.60	19.95	37.55	8.00	29.55
10	Okanagan Centre	M. H. Chesbro	March 12-16	10	82.0	9	16.10	7.10	23.20	10.00	13.20
11	Vernon	P. E. French ..	March 6-10	6 (Adults)	S., 82.5; A., 80.0	10	22.05	6.00	28.05	5.00*	23.05
12	New Denver	E. C. Hunt ...	March 27-31	9	89.0	9	22.05	25.20	47.25	9.00	38.25
				93	76.5	110	$255.65	$190.00	$445.65	$97.00	$348.65

* One not paid.

APPENDIX No. 2.

Packing-schools, 1917.

No.	Place.	Guarantor.	Dates.	Instructor.	No. of Lessons.	Pupils.		Sale of Fruit.	Fees received.	Total Expenses.	Total Receipts.	Net Expenses.
						No.	Average Proficiency.					
							Per Cent.					
1	Duncan	High School	Jan. 22-27	F. E. Loveday	5	18	85.0					
2	"	Junior 4th	" 22-27	"	5	17	79.0	....	....	$ 86 65	....	$ 86 65
3	"	Class A, Div. 1	" 22-27	"	5	17	80.0					
4	Keatings	F. G. Gold	" 29-31	"	6	8	83.0	....	$ 8 00	37 50	$ 8 00	29 50
5	Okanagan Centre	P. W. Pixton	Feb. 5-10	"	12	20	84.0	....	40 00	116 23	40 00	76 23
6	Naramata	T. H. Rayner	" 12-14	"	8	14	84.5	....	14 00	45 05	14 00	31 05
7	Kaleden	F. W. King	" 15-17	"	8	9	85.0	....	9 00	41 00	9 00	32 00
8	West Summerland	Jno. Tait	" 19-24	"	11	21	86.0	....	42 00	97 15	42 00	55 15
9	Keremeos	L. O. Keeler	Feb. 26-March 3	"	10	17	87.0	$5 00	34 00	103 85	39 00	64 85
10	"	School pupils	" 27- " 3	"	5	11	83.0					
11	Salmon Arm	E. Doberer	March 19-24	"	12	12	84.5					
12	"	High School	" 12-17	"	6	15	83.0					
13	"	Public School (senior)	" 12-17	"	6	16	83.0	....	24 00	153 85	24 00	129 85
14	"	" (junior)	" 12-17	"	6	16	81.0					
15	Vernon	J. B. Brown (night-school)	Jan. 22-27	J. B. Castner	6	17	95.0		17 00		17 00	
16	"	" (day-school)	" 22-27	"	12	8	95.5	....	16 00	105 16	16 00	72 16
17	Coldstream	Rev. Mackie's School (senior)	" 29-Feb. 3	"	....	8	91.0	....	....	....	....	....
"	"	" (junior)	" 29- " 3	"	....	8	84.0	....	....	....	....	....
18	Long Lake		" 29- " 3	"	12	14	92.5	....	25 00	81 85	25 00	56 85
19	Vernon	Afternoon	Feb. 5-10	"	6	16	95.0	....	16 00	39 81	16 00	5 81
20	"	Evening	" 5-10	"	6	18	95.5	....	18 00		18 00	
21	Kelowna	R. L. Dalglish	" 26-March 3	"	12	13	94.0	....	26 00	104 73	42 00	62 73
22	"	"	" 26- " 3	"	6	16	95.0	....	16 00			
23	"	Public School	March 5-10	"	....	31	80.0	....	....	112 63	....	112 63
24	"	"	" 5-10	"	....	38	79.0	....	....			
25	Peachland	W. M. Dryden	Feb. 19-24	"	12	15	94.5	....	30 00	122 70	30 00	92 70
26	"	Public School	" 19-24	"	....	20	94.0	....	....			
27	Oyama	J. Hicks	" 12-17	"	12	26	96.0	....	50 00	129 33	50 00	79 33
28	Vernon	High School (senior)	March 19-24	"	....	20	93.0					
29	"	" (junior)	" 19-24	"	....	18	89.0					
30	"	Public School (a.m.)	" 26-31	"	....	20	86.0	....	....	119 67	....	119 67
31	"	" (p.m.)	" 26-31	"	....	21	88.5					
32	Oceola	School, cancelled	" 26-31	"	....	..	....	....	....	19 55	....	19 55
33	Sorrento	C. R. Newman	April 10-13	"	6	8	90.5	5 00	8 00	72 75	13 00	59 75
34	Maple Ridge	School pupils	Jan. 29-Feb. 3	J. Sewell	10	28	88.0	....	....			
35	Haney	"	Feb. 5-10	"	12	27	81.0	....	....	184 41	18 00	166 41
36	"	M. H. Robertson	" 5-10	"	6	11	80.0	7 00	11 00			
37	Westbank	M. Russell	March 26-31	"	12	7	92.0					
38	"	"	" 26-31	"	6	5	87.0	....	19 00*	93 82	19 00	74 82
39	Central Park	B. Forsyth	Feb. 13-14-15	"	6	11	80.0	7 00	11 00	58 74	18 00	40 74
40	Harrop	W. J. McConnell	" 19-24	"	12	9	88.0					
41	"	School pupils	" 19-24	"	6	9	81.5	2 00	18 00	72 07	20 00	52 07
42	Needles	O. J. Aspinall	" 28-March 6	"	12	11	90.0	4 00	22 00	71 37	26 00	45 37
43	Mission City		March 14-17	"	12	12	86.0	7 50	23 00	120 06	30 50	89 56
44	Nakusp		" 8-14	"	6	7	80.0					
45	"	School pupils	" 8-14	"	6	18	73.0	....	7 00	100 79	7 00	93 79
46	"	"	" 9-14	"	6	15	77.0					
47	Lytton	L. Dawson	" 19-21	"	6	12	66.0	....	12 00	29 43	12 00	17 43

APPENDIX No. 2—*Concluded.*

PACKING-SCHOOLS, 1917—*Concluded.*

No.	Place.	Guarantor.	Dates.	Instructor.	No of Lessons.	Pupils.		Sale of Fruit.	Fees received.	Total Expenses.	Total Receipts.	Net Expenses.
						No.	Average Proficiency.					
48	Grand Forks	School pupils	Feb. 5-10	E. C. Hunt	12	30	76.0	6 50	....	61 18	6 50	54 68
49	"	C. C. Heaven	" 26-March 2	"	12	12	84.5	13 50	24 00	55 66	37 50	18 16
50	Creston	School pupils	" 12-18	"	12	32	75.5	10 00	11 00	88 12	21 00	67 12
51	"	J. A. Lidgate	" 12-18	"	6	11	78.0					
52	South Slocan	E. Jamieson	" 20-22	"	6	9	81.0	5 00	9 00	46 33	14 00	32 33
53	Penticton	J. F. Park	" 19-24	J. Lawler	13	13	78.0	3 00	26 00	91 25	29 00	62 25
54	West Summerland	School pupils	" 26-March 3	"	6	59	77.0	....	....	105 71	....	105 71
55	Penticton	"	March 5-10	"	6	35	79.0					
56	"	"	" 5-10	"	6	19	75.0	4 95	....	148 66	4 95	143 71
57	"	"	" 5-10	"	6	34	81.0					
58	Nelson		" 12-18	"	12	15	80.0					
59	"	High School	" 12-18	"	....	18	77.0	....	30 00	118 76	30 00	88 76
60	Willow Point		" 19-21	"	6	14	81.5	....	11 00	58 23	11 00	47 23
61	Bonnington		" 22-24	"	6	8	82.0	3 00	8 00	65 40	11 00	54 40
	Totals				....	1,037	84.5	$83 45	$635 00	$3,159 45	$718 45	$2,441 00

*Seven at $2 and five at $1.

APPENDIX No. 3.

Amount of Fruit and Vegetables received at Vancouver during 1917.

		British Columbia.	Imports.
Apples	boxes	115,215	62,483
Apricots	crates	1,970	6,350
Blackberries	crates	612	56
Cherries	lb.	21,000	127,660
Crab-apples	boxes	1,317	80
Currants	crates	1,400	...
Gooseberries	crates	1,600	27
Peaches	boxes	10,186	56,153
Pears	boxes	2,868	12,827
Plums and prunes	crates	14,111	12,287
Raspberries	crates	4,300	57
Strawberries	crates	13,400	8,385
Loganberries	crates	333	10
Asparagus	boxes	2,300	1,300
Lettuce	crates	1,400	3,200
Mixed vegetables	tons	4,800	410
Onions	tons	1,100	350
Peppers	boxes	26	2,228
Potatoes	tons	8,627	1,294
Rhubarb	boxes	3,915	1,527
Tomatoes	boxes	22,800	2,950
Cantaloupes	crates	5	3,700
Egg-plant	boxes	90	265
Nectarines	boxes	100	5

APPENDIX No. 4.

Stocks of Fruits and Vegetables on hand in the City of Vancouver.

	1914.	1915.	1916.	1917.
Apples, B.C. boxes	5,772	16,711	21,150	34,020
Apples, U.S. boxes	865	18,170	8,400	6,700
	6,637	34,881	29,550	40,720
Potatoes, B.C. sacks	48,670	30,120	85,600	31,527
Onions, B.C. sacks	680	310	1,920	14,600

APPENDIX No. 5.

STATEMENT RELATING TO SOUTHERN OKANAGAN FRUIT AND VEGETABLE EXPERIMENT STATION.

Receipts and Expenses, Season of 1917.

Receipts.			*Expenses.*	
Vegetables—			Hired labour	$1,073 50
Plants sold	$ 67 10		Land and water taxes	88 75
Cucumbers	3,728 30		Boxes, nails, and paper	818 90
Tomatoes	161 00		Horse-feed bought	128 50
Sweet peppers	820 00		Manure and fertilizer	58 00
Egg-plant	829 80		Stationery, postage, telegraphing, smithy, and incidental expenses	70 20
Cantaloupe	123 35			
		$5,729 55		
Fruits—				
Red currants	$ 153 45			
Black currants	19 80			
Gooseberries	23 30			
Black raspberries	9 90			
Sweet cherries	36 00			
Plums	33 40			
Prunes	6 25			
Pears	9 25			
Apricots	249 45			
Apples (net)	924 75			$2,237 85
		$1,465 55	Balance, being profit	4,957 25
		$7,195 10		$7,195 10

APPENDIX No. 6.

Chilliwack Cow-testing Association.

No.	Name of Cow and Breed.	Owner.	Address.	Milk.	Butter-fat.
	Two Years old.			Lb.	Lb.
1	Mabel, Gr. J.	A. E. Dumvill	Sardis	8,436	371.9
	Cherry, Gr. J.	S. W. Keith	Chilliwack	8,690	371.9
2	Bess, Gr. J.	M. Clarkson	Chilliwack	8,047	356.4
	Three Years old and over.				
1	Brindle, Gr. J.	A. E. Dumvill	Sardis	13,811	659.8
2	Fox 7, Reg. G.	C. Hawthorne	Chilliwack	15,469	647.7
3	Nancy, Gr. J.	G. T. Richards	Chilliwack	11,271	527.9

Langley-Surrey Cow-testing Association.

	Two Years old.				
1	Dinah, Gr. Ayr	Shannon Bros.	Cloverdale	11,048	398.2
2	Fortune, Gr. Ayr	Shannon Bros.	Cloverdale	9,465	341.4
3	White, Gr. S.	Haggerty Bros.	Murrayville	7,451	310.9
	Three Years old and over.				
1	Lily, Gr. H.	Alex. Hastie	Clayburn	10,767	563.3
2	No. 8, Gr. H.	L. H. Delesalle	Matsqui	15,415	519.9
3	Ruby, Gr. J.	B. A. Harrison	Langley	9,909	478.0

Delta Cow-testing Association.

	Two Years old.				
1	Belle, Gr. H.	Alex. Davie	Ladner	10,199	373.9
2	Perfection, Gr. H.	Alex. Davie	Ladner	10,312	359.9
3	Blanch, Gr. H.	Alex. Davie	Ladner	10,326	324.9
	Three Years old and over.				
1	Lady Bountiful, Gr. S.	A. D. Paterson	Ladner	13,027	515.4
2	Dairy Maid, Gr. H.	E. B. Nobles	Ladner	13,992	515.1
3	Cherry, Gr. J.	E. B. Ladner	Ladner	9,814	474.4

Comox Valley Cow-testing Association.

	Two Years old.				
1	Nancy, Gr. Ayr	G. O. Game	Comox	8,694	370.9
2	Annie, Gr. J.	H. Gurney	Sandwick	4,940	293.7
3	Tiny, Gr. J.	H. Gurney	Sandwick	5,912	287.0
	Three Years old and over.				
1	Boss, Gr. J.	W. T. Wain & Son	Courtenay	10,378	447.3
2	Rose, Gr. J.	W. T. Wain & Son	Courtenay	10,023	444.5
3	Tiny, Gr. J.	R. U. Hurford	Courtenay	8,401	435.6

APPENDIX No. 7.

SHOWING RECORDS OF INDIVIDUAL COWS, BRITISH COLUMBIA.

Madam Posch Pauline, No. 10291, C.H.F.H.B.

	Age.			Milk.	Butter-fat.	Butter, 80% Fat.
	Y.	M.	D.	Lb.	Lb.	Lb.
7-day record	8	5	9	835.6	27.42	34.28
30-day record	8	5	9	3,386.6	109.20	136.50
60-day record	8	5	9	6,490.5	209.88	262.36
90-day record	8	5	9	9,464.9	305.51	381.92
120-day record	8	5	9	12,233.1	396.25	495.31
240-day record	8	5	9	21,054.5	686.70	858.39
365-day record	8	5	9	27,597.4	898.77	1,123.53

NOTE.—This record was finished about August 1st, 1917, and up to that time is the largest *official* milk record yet reported in Canada, and the second largest butter record.

Zarilda Clothilde 3rd De Kol, No. 14887, C.H.F.H.B.

	Age.			Milk.	Butter-fat.	Butter, 80% Fat.
	Y.	M.	D.	Lb.	Lb.	Lb.
7-day record	6	10	12	831.3	24.89	31.12
30-day record	6	10	12	3,331.7	97.79	122.25
60-day record	6	10	12	6,718.0	187.16	233.96
90-day record	6	10	12	9,940.5	270.88	338.62
120-day record	6	10	12	13,009.8	353.81	422.28
240-day record	6	10	12	23,260.0	644.87	806.11
365-day record	6	10	12	30,467.3	857.30	1,071.60

NOTE.—This record was finished in November, 1917, and thus establishes a new strictly official world's record for milk production. The Canadian record for butter-fat production is still held by the British Columbia cow "Lady Pietje Canary's Jewel," No. 17314.

APPENDIX No. 8.

List of Creameries in British Columbia.

Name.	Secretary or Manager.	P.O. Address.
Burns, P., & Co., Ltd.	M. R. Silver	Woodland Drive, Vancouver.
Chilliwack Creamery Association, Ltd.	W. K. MacLeod	Chilliwack.
Comox Creamery Association, Ltd.	R. U. Hurford	Courtenay.
Cowichan Creamery Association, Ltd.	W. Paterson	Duncan.
Cranbrook Butter Co., Ltd.	H. A. Ammerman	Cranbrook.
Curlew Creamery Co.	Ira Carter	Grand Forks.
Heffley Creamery	T. Bunting	Heffley Creek.
Kamloops District Creamery Association	J. A. Magar	Kamloops.
Kelowna Creamery Co., Ltd.	W. G. Benson	Kelowna.
Meadowbrook Creamery Co.	A. P. Slade	199 Water Street, Vancouver.
Nanaimo Creamery Association, Ltd.	Jos. Randle	Nanaimo.
Curlew Creamery Co., Ltd.	I. Carter	Nelson.
New Westminster Creamery Co., Ltd.	D. E. Mackenzie	New Westminster.
Northwestern Creamery, Ltd.	Norton & Snelling	Victoria.
Northern Okanagan Creamery Association, Ltd.	A. E. Sage	Armstrong.
Oxford Dairy Co., Ltd.	J. Burmeister	New Westminster.
Revelstoke Creamery Co., Ltd.	H. McKinnon	Revelstoke.
Fraser Valley Milk Producers' Association	E. G. Sherwood	1327 Standard Bank Building, Vancouver.
Royal Dairy Co.	C. W. McAllister	Douglas Street, Victoria.
Royal Dairy Co.	A. A. Young	1001 Pender Street West, Vancouver.
Saltspring Island Creamery Association, Ltd.	F. L. Wheeler	Ganges Harbour, Saltspring Island.
Salmon Arm Creamery Association, Ltd.	R. Karnagel	Salmon Arm.
Spencer, David, Ltd.	W. S. Smith	Cordova Street West, Vancouver.
Standard Milk Co., Ltd.	E. W. Clark	405 Eighth Avenue West, Vancouver.
Turner's Dairy, Ltd.	F. Turner	Seventeenth Avenue and Ontario Street, Vancouver.
Vancouver Creamery Co., Ltd.	J. M. Livingstone	15 Alexander Street, Vancouver.
Clayburn Creamery	H. Hanson	Clayburn.
Condenseries.		
B.C. Milk Condensing Co., Ltd.	L. Chevalley	Sardis.
Courtenay Milk Condensing Co., Ltd.	E. G. Emery	Courtenay.
Pacific Milk Products Co.	Bert W. Keatings	Ladner.

APPENDIX No. 9.

Summary of Creamery Report, 1917.

Number of creameries	27
Number of patrons	1,550
Number of visits to creameries	49
Number of creameries using pasteurizer	5
Average per cent. of fat in cream	27-30
Average per cent. of moisture in butter	15
Average amount of salt per pound of butter	5/8 oz.
Number of creameries using Babcock test	27
Number of creameries using cream-scales (metric)	26
Number of creameries testing each delivery of cream separately	10
Number of creameries using composite samples	17
Number of creameries having mechanical refrigeration	12
Average temperature of storages	45° Fahr.
Number of creameries having poor water-supply	2
Number of creameries having poor system of sewage-disposal	1
Expenditure, new creameries and general improvements	$16,700

APPENDIX No. 10.

WRITTEN EXAMINATION FOR TESTER'S LICENCE, "DAIRIES REGULATION ACT."

1. Give briefly directions for testing milk with a Babcock tester	15
2. What are the various uses of the Babcock test?	10
3. Upon what principle is the Babcock test founded? Explain briefly	10
4. How much milk by weight is supposed to be placed in the Babcock test-bottle, and why do we use a 17.6-c.c. pipette for that purpose?	10
5. Name four important requirements for accurate testing of milk and cream	5
6. What are the principal points to be considered in taking and keeping samples for composite tests?	10
7. (*a.*) Upon what factors is the quantity of preservative used in composite tests dependent?	5
(*b.*) In case of trouble with mould growing on the walls of composite test-bottles, give remedy	5
8. (*a.*) When the milk sample is sour and contains lumps of curd, how should it be treated before testing?	5
(*b.*) How should composite samples of milk and cream be prepared for the test?	5
9. (*a.*) Explain briefly why cream for testing should be weighed into the test-bottle rather than measured by pipette	5
(*b.*) What precaution should be observed in the weighing of the cream?	5
(*c.*) What is the correct weight for testing cream?	5
10. (*a.*) What action has sulphuric acid on milk?	5
(*b.*) At what specific gravity and how much acid should be used?	5
(*c.*) At what temperature should milk and acid be before mixing?	5
11. (*a.*) What is the required speed in revolutions per minute of a tester whose diameter is 18 inches?	5
(*b.*) How is the speed of a turbine tester ascertained?	5
12. (*a.*) What is the proper temperature of the water to be added to the test-bottles while making the test?	5
(*b.*) How many minutes should the bottle be whirled in the tester?	5
13. Draw diagrams of how the test should be read:—	
First, for milk	5
Second, for cream	5
14. If foam appears on the surface of the fat column, what is it caused by? What remedy should be applied?	5
15. (*a.*) What are the causes of dark-coloured or burnt readings?	5
(*b.*) What are the causes of light-coloured or cloudy readings?	5
16. At what temperature should the test be read, and how is this temperature best regulated?	5
17. Find the correct average test of:— Cow No. 1, 340 lb. milk, testing 4.3 per cent. Cow No. 2, 460 lb. milk, testing 4.0 per cent. Cow No. 3, 760 lb. milk, testing 3.0 per cent. Cow No. 4, 620 lb. milk, testing 3.5 per cent.	10
18. What is the composition of average, normal milk?	10
Total	180

APPENDIX No. 11

Sixth International Egg-laying Contest, Victoria, B.C.

Class 1.—Light-weight Varieties (Six Birds to a Pen).

Pen.	Name and Address.	Breed.	Total Eggs.
1	J. O. M. Thackeray, Chilliwack (winner of first prize, $100)	White Leghorns ...	1,193
16	H. Dryden, Corvallis, Oregon (winner of second prize, $50) ..	White Leghorns ...	1,064
10	G. O. Pooley, R.R. 1, Duncan (winner of third prize, $25) ...	White Leghorns ...	1,061
8	Graves & McCulloch, Saturna Island (winner of fourth prize, $10)	White Leghorns ...	1,046
21	P. D. Hillis, Rocky Point (winner of fifth prize, *Canadian Poultry Review* bronze medal)	White Leghorns ...	1,027
4	Norie Bros., Cowichan (winner of sixth prize, bronze medal, given by H. D. Reid)	White Leghorns ...	1,016
17	J. L. Smith, Shawnigan Lake	Buttercups	993
6	W. McEwan, R.M.D. 1, Duncan	White Leghorns ...	990
9	Mr. and Mrs. R. W. Chalmers, Thrums	White Leghorns ...	971
7	W. Bradley, Maywood	White Leghorns ...	969
15	M. H. Ruttledge, R.R. 2, Sardis	White Leghorns ...	968
11	Madrona Farms, R.R. 4, Victoria	White Leghorns ...	945
12	F. E. Pullen, Whonnock	Anconas	927
2	D. Edwards, Somenos	White Leghorns ...	916
20	F. Hoey, R.M.D. 1, Duncan	White Leghorns ...	910
18	L. M. Ross, Cowichan	White Leghorns ...	904
13	H. A. Hincks, Langford Station	White Leghorns ...	879
3	A. V. Lang, R.R. 3, Victoria	White Leghorns ...	873
14	C. G. Golding, Qualicum	White Leghorns ...	801
5	Mrs. F. C. Kenward, Invermere	White Leghorns ...	791
19	H. Colbourn, Forty-ninth Avenue W., Vancouver	Black Minorcas ...	701
	Total	....	19,944

Class 2.—Heavy Weights (Six Birds to a Pen).

37	Messrs. Dean Bros., Keatings (winner of first prize, $100) ...	White Wyandottes..	1,188
34	E. D. Read, Duncan (winner of second prize, $50)	White Wyandottes..	1,174
39	F. W. Frederick, Phoenix (winner of third prize, $25)	R.I. Whites	1,095
27	G. D. Adams, Box 840, Victoria (winner of fourth prize, $10)	White Wyandottes..	1,087
25	V. T. Price, Dublin, Ireland (winner of fifth prize, *Canadian Poultry Review* bronze medal)	S.C. Reds	1,069
33	P. S. Lampman, York Place, Oak Bay (winner of sixth prize, bronze medal, given by H. D. Reid)	S.C. Reds	1,030
35	S. S. F. Blackman, R.M.D., Sidney	S.C. Reds	1,012
28	Norfolk Farms, St. Williams, Ont.	Barred Rocks	995
30	F. G. Barr, Colquitz	White Wyandottes..	988
36	A. W. Cooke, Kelowna	Buff Orpingtons ...	974
22	W. H. Mahon, Duncan	White Wyandottes..	969
38	Regan Bros., Seventy-eighth Avenue, Edmonton, Alta.	Buff Orpingtons ...	948
24	W. H. Catterall, Mount Tolmie	White Wyandottes..	922
26	J. P. Wood, R.R. 1, Cowichan Bay	S.C. Reds	919
29	R. N. Clerke, Vernon	R.C. Reds	883
23	W. H. Willins, Stannard Avenue, Victoria	R.C. Reds	874
40	D. Gibbard, Mission	Barred Rocks	798
32	A. L. Lowe, Lake Hill P.O.	S.C. Reds	766
31	J. P. Bloore, Chilliwack	White Wyandottes..	725
	Total	....	18,416

Special-prize winners: Best winter-egg yield, Class 1, J. Thackeray, Chilliwack; Class 2, G. Adams, Victoria; both winners of silver medals donated by J. Idiens & Son, Victoria.

Winners of *Poultry, Pigeons, and Pet Stock Journal* silver medals to pens laying most eggs during three concluding months: Class 1, Pen 10; Class 2, Pen 34.

APPENDIX No. 11a.

SUMMARY OF RESULTS, SIXTH INTERNATIONAL EGG-LAYING CONTEST, VICTORIA, B.C.

Duration of contest (months)	12
Number of pens	40
Number of birds	240
Number of eggs laid	38,360
Value of eggs laid	$1,310.63
Average monthly revenue	$109.21
Cost of feeding	$611.05
Average monthly feed cost	$50.92
Profit over cost of feeding	$699.58
Average price of eggs per dozen	.41
Highest price received per dozen (October 9th)	.60
Lowest price received per dozen (March 12th)	.30
Average cost to produce dozen eggs	.19.1
Average number of eggs laid per pen	959
Average number of eggs laid per bird	159.8
Average cost of food per pen (six birds)	$15.27
Average cost of food per bird	$2.54
Profit over cost of feed per pen	$17.48
Profit over cost of feed per bird	$2.91
Eggs laid by winning pen, Class 1	1,193
Average per bird winning pen, Class 1	198.8
Eggs laid by winning pen, Class 2	1,183
Average per bird winning pen, Class 2	198

COMPARISON BETWEEN FOURTH CONTEST (12 MONTHS), 1914-15, AND SIXTH (12 MONTHS), 1916-17 (240 BIRDS IN EACH CONTEST).

	Fourth Contest.	Sixth Contest.
Number of eggs laid	39,757	38,360
Cost of feed	$527.38	$611.05
Profit over cost of feed	$549.37	$699.58
Average price of eggs	.32.5	.41
Cost to produce dozen eggs	15.9	19.1

APPENDIX No. 12.

Poultry Associations in British Columbia, 1917.

Association.	Delegates.	Address.
Arrow Lakes	T. Sellers	Nakusp.
Ashcroft	G. H. T. Edwards	Walhachin.
Central Park	J. A. Thurston	Central Park.
Chilliwack	A. H. Turvey	Chilliwack.
Cobble Hill	Mrs. McMillan	Cobble Hill.
Cowichan	L. F. Solly	Westholme.
Cranbrook	E. T. Cooper	Cranbrook.
Fernie	R. Jones	West Fernie.
Golden	L. F. Mitchell	Golden.
Grand Forks	T. Bowen	Grand Forks.
Greenwood	....	....
Kamloops	W. Brennan	Kamloops.
Kelowna	A. Notley	Kelowna.
Ladysmith	....	....
Langford	H. A. Hincks	Langford Station.
Maple Ridge	A. H. Anderson	Port Hammond.
Mission City	Rev. C. McDiarmid	Mission City.
Nanaimo	J. Isherwood	Nanaimo.
New Denver	B. Parkinson	New Denver.
Northern Okanagan	H. A. Allison	Armstrong.
North Vancouver	W. W. McGregor	230 Twenty-eighth Street, North Vancouver.
Penticton	J. F. Reason	Penticton.
Point Grey	Mrs. Barnes	Kerrisdale.
Parksville	W. Stanhope	Parksville.
Revelstoke	F. Bourne	Revelstoke.
Saltspring Island	Rev. G. Dean	Ganges Harbour.
Summerland	J. Tait	Summerland.
Trail	J. A. Wadsworth	Trail.
Vernon	H. E. Waby	Enderby.
Victoria	D. Nicol	Bank Street, Victoria.
Vancouver	R. Wilson	Vancouver.
West Kootenay	G. Horstead	Nelson.
Whonnock	....	....

APPENDIX No. 13.

FERTILIZER TESTS WITH POTATOES.

Variety.	Grade.	Manure, 20 Tons; Lime, 1½ Tons per Acre.	Lime, 1½ Tons per Acre.	Check, No Treatment.	Manure, 20 Tons per Acre.	Sodium Nitrate, 100 Lb.; Superphosphate of Lime, 300 Lb. per Acre.	Average of All Treatments.
		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Eureka	Marketable ..	12.224	3.400	4.355	7.537	...	6.879
Eureka	Unmarketable	1.566	1.719	1.493	1.256	...	1.508
	Totals	13.790	5.119	5.848	8.793	...	8.387
Early St. George	Marketable ..	11.880	3.514	1.065	8.912	2.704	5.615
Early St. George	Unmarketable	2.827	2.101	5.325	2.735	2.577	3.113
	Totals	14.707	5.615	6.390	11.647	5.281	8.728
Carmen No. 1...	Marketable ..	11.383	2.021	2.489	10.412	2.237	5.708
Carmen No. 1...	Unmarketable	1.177	1.642	1.866	1.714	1.300	1.539
	Totals	12.560	3.663	4.355	12.126	3.537	7.247
Burbank	Marketable ..	8.590	6.238	2.613	10.390	3.820	6.330
Burbank	Unmarketable	1.254	1.536	1.742	1.795	1.566	1.579
	Totals	9.844	7.774	4.355	12.185	5.386	7.909
Early Rose	Marketable ..	7.107	.955	1.493	5.080	2.997	3.526
Early Rose	Unmarketable	3.132	3.132	2.115	1.528	1.470	2.275
	Totals	10.239	4.087	3.608	7.608	4.467	5.801
Netted Gem	Marketable ..	2.658	1.052	.933	6.455	2.101	2.639
Netted Gem	Unmarketable	.554	.287	1.478	.725	.458	.700
	Totals	3.212	1.339	2.411	7.180	2.559	3.339
Averages	Marketable ..	8.973	2.863	2.158	8.131	2.772	...
Averages	Unmarketable	1.750	1.736	2.326	1.625	1.474	...
	Totals	10.723	4.599	4.484	9.756	4.246	...

APPENDIX No. 14.

STATEMENT SHOWING AVERAGE YIELDS AND HIGHEST, LOWEST, AND AVERAGE COSTS IN CROP COMPETITIONS, 1917.

Crop.	No. of Reports.	Highest Yield per Acre.	Lowest Yield per Acre.	Average Yield per Acre.	Highest Cost per Ton in Field.	Lowest Cost per Ton on Farm.	Average Cost per Ton on Farm.
		Tons.	Tons.	Tons.			
Potatoes (Field-crop Competitions)	27	17.00	3.00	8.12	$29 33	$ 6 98	$12 90
Potatoes (Boys' and Girls' Competitions)	32	13.00	2.85	7.00	24 30	6 18	15 88
Wheat	2	1.00	0.71	0.85	36 80	27 20	32 00
Oats	3	1.40	0.50	0.90	56 34	15 10	33 07
Grain-hay	6	6.00	2.00	3.40	15 75	6 00	9 57
Carrots	1	...	...	25.00	...	...	3 78

NOTE.—It must be remembered that above reports were submitted by those winning prizes in the various districts. The crops on which reports were submitted were, therefore, above the average of the district, and the cost per ton determined on such crops will be below the cost to the average farmer. This table shows that the cost of growing and delivering at shipping-point of crops averaging 8.12 tons per acre was $137.22. Basing the above charges on a 5.6-ton crop (the average Provincial yield), we find that the cost to grow an average acre of potatoes in British Columbia in 1917 would be $127.14, or $22.70 per ton.

APPENDIX No. 15.

Tuberculin Tests.

	Premises.	Cattle.	Reactors.	Suspects.
Victoria	134	1,169	44	..
Saanich	24	262	12	..
Cowichan	22	266	14	..
Comox	260	1,944	77	..
Denman Island	27	233	7	..
Parksville	81	384	8	..
Alberni	11	43	..	..
Metchosin	2	18	..	..
Cobble Hill	10	127	19	..
Wellington	7	32	1	..
Chemainus	6	103	..	..
Galiano Island	9	57	..	..
Pender Island	2	55	1	..
Essondale	1	245	14	3
Point Grey	25	46	5	..
North Vancouver	15	105	8	..
Vancouver	63	172	8	..
Lulu Island	188	1,895	61	6
Surrey	96	1,131	50	5
Burnaby	19	58	12	..
Kerrisdale	1	4	..	..
Pitt Meadows	10	171	3	..
Mission	5	65	1	..
Matsqui	119	1,604	68	2
Ladner	25	543	36	14
Langley	96	1,526	30	7
Huntingdon	8	190	2	..
Agassiz	4	65	..	..
Prince Rupert	2	55	3	3
Kitwanga	5	26	..	..
Bowen Island	1	17	1	1
Roberts Creek	1	3	1	..
Barnston Island	1	20	2	..
Lytton	2	36	12	..
Cloverdale	1	54	..	5
Campbell River	8	30	..	..
Chilliwack	43	880	27	8
Armstrong	38	101	2	..
Balfour	4	24	..	..
Creston	1	7	..	..
Enderby	1	7	..	..
Ellison	1	1	..	..
Edgewood	4	17	1	..
Fernie	47	204	11	..
Grand Forks	42	122	1	..
Glenrosa	1	5	..	..
Grande Prairie	1	7	..	..
Kelowna	37	106	11	..
Kamloops	13	164	10	..
Lillooet	1	10	3	..
Malakwa	42	97	..	..
Nelson	1	6	..	..
Needles	1	2	..	..
Okanagan Landing	5	52	..	..
Okanagan Centre	7	21	1	..
Oyama	1	1	..	..
Pritchard	1	1	1	..
Penticton	81	171	2	..
Queen's Bay	1	1	..	..
Revelstoke	21	183	..	..
Rossland	29	156	6	..
Rick Island	1	7	..	..
Summerland	4	14	..	..

APPENDIX No. 15—*Concluded.*

TUBERCULIN TESTS—*Concluded.*

	Premises.	Cattle.	Reactors.	Suspects.
Slocan	4	22	..	..
Vernon	159	237	3	..
Sorrento	7	16	..	..
Westbank	1	1	1	..

APPENDIX No. 16.

SILOS BUILT IN BRITISH COLUMBIA, 1917.

Name.	Place.	Size.	Capacity.
		Feet.	Tons.
Agur, R. V.	Summerland	12 x 30	68
Calhoun, H.	Tappen	12 x 26	59
Carlin, J. C.	Shuswap	16 x 28	112
Carlin, J. A.	Tappen	12 x 26	59
Davie, A.	Ladner	16 x 34	136
Dawson, Rev. L.	Lytton	14 x 32½	100
Dean Bros.	Keatings	12 x 30	68
Gainer, R. H.	Mount Olie	10 x 30	47
Green, C. R.	Beresford	12 x 30	68
Hall, C. S.	Salmon Valley	11 x 30	57
Lowe, W. H.	Cobble Hill (two)	16 x 32	256
McGuire, J. D.	Salmon Arm	12 x 28	64
McLean, H.	Kamloops	10 x 26	40
Nelson, N.	Saltspring Island	11 x 32	62
Oldfield & Son	Elk Lake	10 x 26	40
Pemberton, F. B.	Cowichan	16 x 30	120
Piercy, H.	Denman Island	11 x 30	57
Robson, J. M.	South Vancouver	10 x 26	40
Spetch, S. W.	Pemberton Meadows	10 x 22	35
Thulin, F.	Lund	10 x 26	40
Townsend, F. W.	Mount Tolmie	10 x 26	40
Troup, H. D.	Gabriola Island	10 x 20	32

APPENDIX No. 17.

SILOS FILLED IN BRITISH COLUMBIA, 1917.

Name.	Place.	Size.	Capacity.	Crops Used.
		Feet.	Tons.	
Bekker, B.	Errington	10 x 20	32	Corn.
Calhoun, H.	Tappen	12 x 26	59	Corn.
Carlin, J. C.	Shuswap	16 x 28	112	Corn.
Carlin, J. A.	Tappen	12 x 26	59	Corn.
Dawson, Rev. L.	Lytton	14 x 32½	100	Corn.
Green, C. R.	Beresford	12 x 30	68	Oats and vetch.
Heddle, M.	Willow Point	10 x 20	32	Corn.
Lowe, W. H.	Cobble Hill (two)	16 x 32	256	Oats.
Macdonald, J. D.	Willow Point	10 x 26	40	Corn.
McLean, H.	Kamloops	10 x 26	40	Corn and alfalfa.
Piercy, H.	Denman Island	11 x 32	57	Corn.
Strickland, C. E.	Enderby	12 x 30	68	Alfalfa.

APPENDIX No. 17—*Concluded.*

Silos built and filled, 1916 and 1917.

	Number built.	Capacity.	Number filled.	Capacity.
	Tons.			Tons.
1916	13	920	11	620
1917	23	1,600	13	923

APPENDIX No. 18.

Temporary Staff Appointments.

Nature of Appointment.	No.
Advisory Board of Women's Institutes, Secretary	1
Agriculturists (District)	3
Assistant Horticulturist	1
Caretakers—	
Demonstration Plots	8
Egg-laying Contest	1
Carpenter	1
Clerical	5
Cow-testers	7
Foremen at Dry Farms	2
Farm Superintendent	1
Inspectors—	
Assistant, Fruit Pests	2
Brand	2
District Fruit (with Assistants)	26
Foul-brood	3
Imported Fruits at Ports of Entry	17
Potatoes	1
Judges (fall fairs)	17
Lecturers	1
Markets Commissioner	1
Milk-testers	2
Plant Pathologist (Assistant)	1
Publications Branch (Editor)	2
Soil and Crop Instructor	1
Silo Demonstrator	1
Veterinary Inspectors	2
Total	109

APPENDIX No. 19.

TOTAL CORRESPONDENCE RECEIVED AND DISPATCHED BY THE DEPARTMENT OF AGRICULTURE FOR THE YEARS ENDING DECEMBER 31ST, 1916, AND 1917.

	RECEIVED.		DISPATCHED.	
	1917.	1916.	1917.	1916.
Deputy Minister's Office—				
General	4,434	4,762	7,781	5,809
Farmers' Institutes	1,829	1,878	1,606	1,586
Women's Institutes	1,397	1,423	1,140	1,232
Agricultural Associations	744	681	818	670
Publications Branch	1,292	434	536	316
Re Bulletins	...	989	...	174
Horticultural Branch—				
British Columbia Fruit-Growers' Association	694	1,035	731	763
Horticulture	1,604	1,550	1,603	1,555
Inspection of Fruit Branch	660	820	862	960
Live Stock Branch—				
General	4,548	3,119	4,788	3,840
Dairy Division	923	767	1,303	1,175
Poultry Division	1,436	1,695	1,222	1,555
Soil and Crop Division	1,869	1,744	2,562	2,221
Totals	21,430	20,897	24,952	21,856
Increase	533	...	...	...
Decrease	...	...	3,096	...

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APPENDIX No. 20.

New Bulletins, Circulars, and Miscellaneous Publications issued by Department of Agriculture in 1917.

Date.	No. issued.	No.	Name.
Feb. 3.....	2,000	...	Poultry-breeders' Directory.
Feb. 6.....	400	...	Programme, Stock-breeders' Convention.
Feb. 10.....	4,000	...	Programme, Farmers' Institute meetings.
Feb. 12.....	750	Bull. 75	Boys' and Girls' Crop Competitions.
Feb. 28.....	1,000	Cir. 14	Community Breeding.
March 6.....	4,000	...	Agricultural Journal, March.
March 9.....	1,000	...	List of Publications.
March 14.....	200	...	Notice to Nurserymen.
March 19.....	700	...	Circular, Disinfecting Seed-potatoes.
March 24.....	750	Cir. 15	Crop and Live Stock Report, 1916.
March 27.....	500	...	Additional, Disinfecting Seed-potatoes.
March 30.....	750	Bull. 75	Boys' and Girls' Crop Competitions.
April 2.....	1,000	...	Additional, Disinfecting Seed-potatoes.
April 3.....	4,000	...	Agricultural Journal, April.
April 19.....	500	...	Circular *re* Alfalfa and Clover Seed Produce.
April 26.....	500	...	Circular *re* Mosquito-control.
May 1.....	4,000	...	Agricultural Journal, May.
May 1.....	5,000	Cir. Bull. 20	Chicken-pox in Poultry.
May 15.....	1,000	...	Instructions *re* "Noxious Weeds Act."
May 30.....	500	...	Programme, Dairy Convention.
June 5.....	1,200	...	Twenty-seventh Annual Report, British Columbia Fruit-growers' Association.
June 8.....	1,000	Bull. 76	Agricultural Statistics, 1916.
June 8.....	4,000	...	Agricultural Journal, June.
July 18.....	4,000	...	Agricultural Journal, July.
July 20.....	2,000	Cir. 15	British Columbia Farmer and his Silo.
Aug. 9.....	5,000	...	Agricultural Journal, August.
Aug. 15.....	2,000	...	List of Publications.
Aug. 28.....	150	...	Women's Institute Programme.
Aug. 29.....	4,000	...	Agricultural Journal, September.
Aug. 29.....	2,000	...	Circular on Statistics.
	250	...	Rules, Seventh Egg-laying Contest.
Sept. 4.....	400	...	Leaflets, Songs for Women's Institute Conferences.
	150	...	Programme, Women's Institute Conferences.
Sept. 7.....	150	...	Programme, Women's Institute Conferences.
Sept. 18.....	150	...	Programme, Women's Institute Conferences.
	100	...	Rules, "Dairies Regulation Act."
Oct. 1.....	2,000	...	Supplement to Brand Book.
Oct. 16.....	1,600	...	Reply Post-cards for Honey Reports.
Oct. 18.....	5,000	Cir. 17	Crop Report for September.
Oct. 24.....	4,000	...	Journal for October.
Oct. 29.....	3,000	...	Leaflets, Agricultural Relief of the Allies.
Oct. 30.....	500	...	Programmes, Armstrong.
	500	...	Programmes, New Westminster
Nov. 17.....	3,000	Cir. 18	Crop Situation in British Columbia.
Nov. 19.....	4,000	...	Agricultural Journal, November.
Dec. 3.....	400	...	Diaries *re* Cost of Producing Farm Crops.
Dec. 17.....	4,300	...	Agricultural Journal, December.
Dec. 29.....	1,000	...	Annual Report of Department, 1916.
Total	88,400		

APPENDIX No. 21.

BULLETINS AND CIRCULARS SENT OUT DURING THE YEAR 1917.

Bulletins.

		No. sent out.
No.	26. Practical Poultry-raising	3,312
,,	33. Fruit-growing Possibilities on Skeena River	261
,,	39. Natural and Artificial Incubating and Breeding	1,618
,,	44. Irrigation in British Columbia	150
,,	48. Exhibiting Fruits and Vegetables	906
,,	49. Market Poultry	1,714
,,	54. British Columbia Women's Handbook	175
,,	55. Care and Marketing of Eggs	1,619
,,	58. Farm Storages for Fruits and Vegetables	140
,,	59. Agricultural Statistics for the year 1913	1,535
,,	60. Hog-raising in British Columbia	1,922
,,	63. Poultry-house Construction	2,930
,,	64. Angora and Milch Goats	2,594
,,	65. Agricultural Statistics of British Columbia, 1914	475
,,	66. Silos and Silage	1,685
,,	67. Feeding and Management of Dairy Cattle	2,595
,,	68. Diseases and Pests of Cultivated Plants	3,436
,,	69. Field-crop Competitions, 1916	1,020
,,	70. Boys' and Girls' Field-crop Competitions	1,410
,,	71. Butter-making on the Farm	1,934
,,	72. Milk-testing and Dairy Records	475
,,	73. Field-crop and Seed Competitions, 1917	1,800
,,	74. Breeding and Selection of Commercial Poultry	926
,,	75. Boys' and Girls' Competitions, 1917	1,400
,,	76. Agricultural Statistics of British Columbia, 1916	258
	Total	36,290

Circulars.

		No. sent out.
No.	11. Honey Production in British Columbia, 1916	1,500
,,	12. Seed-growers' Directory	750
,,	13. Instructions *re* Co-operative Variety Tests	1,200
,,	14. Community Breeding	800
,,	15. The British Columbia Farmer and his Silo	2,850
	Total	7,100

APPENDIX No. 21—*Concluded.*

Circular Bulletins.

		No. sent out.
No.	1. Thousand-headed Kale	246
„	2. Tuberculosis in Poultry	85
„	3. Construction of Fresh-air Brooders	130
„	4. Management of Turkeys	411
„	5. Clover Dodder	645
„	6. Seed Improvement	525
„	7. Keeping Poultry Free from Lice	1,671
„	8. Corn-growing in British Columbia	80
„	10. Care of Milk and Cream	760
„	11. Poultry-keeping on a City Lot	628
„	12. Management of Geese	1,306
„	13. Root-seed growing	385
„	14. The Use of Agricultural Lime in British Columbia	2,695
„	15. Profitable Ducks	781
„	18. Noxious Weeds, their Identification and Eradication	650
„	19. Poultry Rations and their Practical Application	1,625
„	20. Chicken-pox in Poultry	728
	Total	13,351

Horticultural Circulars.

No.	2. Onion-culture	185
„	3. Selection of Orchard Sites and Soils	275
„	4. Insects Injurious to Orchards	720
„	6. Spray Calendar	553
„	7. Fungous Diseases of Orchard and Garden	265
„	8. Packing Orchard Fruits	460
„	9. Sprays and Spraying	367
„	10. Potato-culture	560
„	11. Progress and Prospects in Fruit and Vegetable Growing	370
„	12. Orchard Intercrops	360
„	14. Practical Irrigation	410
„	15. Cabbage, Celery, and Tomato Production	720
„	17. Planting Plans and Distances	298
„	18. Fruit Markets Commissioners' Report	60
„	19. Propagation and Selection of Nursery Stock	340
„	22. Thinning Fruit-trees	410
„	24. The Home Vegetable Garden for Southern Interior Districts	375
„	27. Methods of Fruit Picking and Handling	400
„	28. Fertilizers for Fruits and Vegetables	1,775
„	29. Varieties of Fruit recommended for Commercial Planting	1,978
	Total	10,881

Reports.

Annual Report, Department of Agriculture, 1915	262
British Columbia Fruit-growers' Association, Annual Report, 1915	550
British Columbia Fruit-growers' Association Annual Report, 1916	225
Farmers' Institute Annual Report, 1915	350
Women's Institute Annual Report, 1915	260
British Columbia Dairymen's Association Annual Report, 1915	100
Third International Egg-laying Contest Report	375
Proceedings of the Entomological Society, 1916	145
Total	2,267

APPENDIX No. 21—*Concluded.*

Miscellaneous.

Agricultural Journal (monthly)	37,800
List of Agricultural Books recommended for Farmers	126
Revised Rules and Regulations, Board of Horticulture	256
Finance in Relation to Women's Citizenship	225
Rules and Regulations, Women's Institutes	540
List of Books and Magazines recommended for Women's Institutes	120
Rules and Regulations for Farmers' Institutes	530
Stock-breeders' Directory	325
Poultry-breeders' Directory	1,500
British Columbia Crop and Live Stock Reports	4,500
Total	45,922

Summary.

Total Bulletins	36,290
Total Circulars	7,100
Total Circular Bulletins	13,351
Total Horticultural Circulars	10,881
Total Reports	2,267
Total Miscellaneous	45,922
Grand total	115,811

APPENDIX No. 22.

SUMMARY OF APPROPRIATIONS, DEPARTMENT OF AGRICULTURE.

	1915-16.	1916-17.	1917-18.
General—			
Salaries of staff officials	$72,428 00	$73,496 00	$65,752 00
Administration, General Department vote, travelling expenses of officers on duty, and miscellaneous	50,000 00	45,000 00	38,000 00
Agricultural Associations—			
Agricultural Associations, including grants in aid of prize-lists, specific grants for buildings, and judges' expenses	50,000 00	30,000 00	20,000 00
Exhibition			
Exhibition and publicity work	8,000 00	*Nil.*	*Nil.*
Institutes—			
Farmers' and Women's Institutes	27,500 00	27,500 00	22,500 00
Horticulture—			
Board of Horticulture, experimental orchards, demonstration spraying, precooling and cold storage, and British Columbia Fruit-growers' Association	13,250 00	9,750 00	34,250 00
Inspection of fruit, fumigation of nursery stock, etc.	35,000 00	35,000 00	
Fruit-packing schools	2,000 00	1,500 00	
Live stock—			
Various associations	13,250 00	7,750 00	27,500 00
Compensation for cattle slaughtered	25,000 00	12,000 00	
Suppression of noxious weeds	5,000 00	10,000 00	
Totals	$301,428 00	$251,996 00	$208,002 00

APPENDIX No. 23.

"AGRICULTURAL INSTRUCTION ACT, 1917-18."

(A.) Instruction and Demonstration.

1. Agricultural and Horticultural Instructors and District Representatives	$ 3,500 00
2. Field-crop demonstation stations	5,000 00
3. Dry-farming demonstration stations	3,000 00
4. Horticultural demonstration stations	3,000 00
5. Poultry demonstration stations and egg-laying contests	1,500 00
6. Alfalfa-plots	500 00
7. Silo demonstrations	3,000 00
8. Drainage demonstrations	1,000 00
9. Seed-distribution and co-operative variety tests, seed production, seed fairs	5,500 00
10. Dairying Cow-testing Associations	3,000 00
11. Bee-keeping	2,500 00
12. Field-crop Competitions	2,000 00
13. Boys' and Girls' Clubs	1,000 00
14. Fruit-packing schools and demonstrations	1,000 00
15. Market-work	4,500 00
16. Agricultural Journal, Publications Branch	5,000 00

(B.) Investigation and Research.

17. Pathological and entomological investigation and research	2,000 00
18. Weed investigation and survey	1,500 00

(C.) Elementary Agricultural Education.

19. Agricultural instruction in public, high, and normal schools, household science, training of teachers, grants	20,000 00
20. Contingencies and miscellaneous	699 06
Total	$69,199 06

NOTE.—Cost of preparing and printing bulletins and circulars, if undertaken, may be charged the subdivision to which said publications relate.

APPENDIX No. 24.

PROVINCIAL VOTES, YEAR ENDING DECEMBER 31ST, 1917.

Vote.			No. of Vouchers.		Total.
101	96	Administration and miscellaneous	194	448	642
2	7	Board of Horticulture	4	5	9
4	...	Demonstration orchards, etc.	3	...	3
5	...	Cold-storage work	4	...	4
6	99	Fruit-packing schools	57	2	59
7	100	Agricultural Associations	11	34	45
8	102	British Columbia Dairymen's Association	87	4	91
9	103	British Columbia Entomological Society	...	1	1
110	104	British Columbia Fruit-growers' Association	46	17	63
11	106	British Columbia Poultry Association	40	2	42
12	107	British Columbia Stock-breeders' Association	36	20	56
13	108	Flockmasters' Association	...	1	1
14	109	Farmers' Institutes	51	59	110
15	110	Women's Institutes	43	115	158
16	111	Inspection of nursery stock, etc.	92	164	256
17	112	Suppression of diseases, etc.	87	214	301
19	98	Compensation for T.B. cattle killed	36	220	256
120	114	Travelling expenses, officers	114	224	338
...	101	British Columbia Bee-keepers' Association	...	1	1
...	105	British Columbia Goat-breeders' Association	...	2	2
...	15	Special warrant	...	60	60
		Total Provincial vouchers	905	1,593	2,498
		Total Federal vouchers	...	...	1,248
		Grand total	...	...	3,746

APPENDIX No. 25.

FAIRS ARRANGED BY DEPARTMENT OF AGRICULTURE, SEASON 1917.

Circuit No. 1—

Parksville	Sept. 12
Nanaimo	„ 11-13
Evergreen (Farmers' Institute)	„ 13
Lasqueti Island	„ 15
Cape Scott (Farmers' Institute)	„ 17
Denman (Farmers' Institute)	„ 18
Courtenay	„ 20-21
Duncan	„ 20-22
Islands	„ 22
Ladysmith	„ 26-27
Alberni	„ 27
Cobble Hill	Oct. 2-3
Saanichton	„ 5-6

APPENDIX No. 25—*Concluded.*

FAIRS ARRANGED BY DEPARTMENT OF AGRICULTURE, SEASON, 1917—*Concluded.*

Circuit No. 2—		
Vancouver	Aug.	20-26
North Vancouver	Sept.	7-8
Central Park	„	13-15
Maple Ridge	„	18-19
Coquitlam	„	20
Mission	„	20-21
Agassiz	„	26
Langley Fort	„	26
Burquitlam	„	28-29
Surrey Centre	Oct.	3
Aldergrove	„	4-5
Circuit No. 3—		
Heffley Creek	Sept.	19
Pritchard	„	21
Kamloops	„	25-27
Circuit No. 4—		
Invermere	Aug.	29-30
Natal	Sept.	3
Creston	„	5
Cranbrook	„	12-13
Fruitvale	„	15
Trail	„	18-19
Nelson	„	19-20
Rossland (Horticultural Society)	„	21
Grand Forks	„	25-26
Circuit No. 5—		
Kelowna	Sept.	12-13
Armstrong	„	20-21
New Denver	„	25-26
Needles	„	28-29
Burton	Oct.	2
Nakusp	„	3-4
Summerland	„	24-25
Rock Creek (Farmers' Institute)	„	26
Circuit No. 6—		
Prince George	Sept.	11-12
Prince Rupert	„	19-21
Quesnel	„	28-29
Bella Coola	Oct.	12

APPENDIX No. 26.

GRANTS TO AGRICULTURAL ASSOCIATIONS, YEAR ENDING DECEMBER 31ST, 1917.

Nanoose Agricultural Association	$ 100 00
Nanaimo Agricultural and Horticultural Association	500 00
Lasqueti Island Agricultural Association	100 00
Comox Agricultural and Industrial Association	300 00
Cowichan Agricultural Association	600 00
Islands Agricultural and Fruit-growers' Association	400 00
Ladysmith Agricultural Society	350 00
Cobble Hill District Agricultural Association	100 00
North and South Saanich Agricultural Society	300 00
Alberni Agricultural and Industrial Association	200 00
Aldergrove Agricultural Association	100 00
Central Park Agricultural Association and Farmers' Institute	250 00
Maple Ridge Agricultural Association	200 00
Coquitlam Agricultural Association	150 00
Agassiz Agricultural and Horticultural Association	250 00
Langley Agricultural Association	200 00
District of Surrey Agricultural Association	250 00
Burquitlam Agricultural Association	150 00
North Vancouver Horticultural Society	250 00
Mission Agricultural Association	200 00
North Thompson Agricultural Association	150 00
Pritchard Agricultural Association	100 00
Kamloops Agricultural Association	800 00
Windermere District Agricultural Society	300 00
Elk Valley and Natal Agricultural Association	100 00
Cranbrook District Agricultural Association	600 00
Fruitvale Agricultural Association	100 00
Trail Fruit Fair Association	250 00
Nelson Agricultural and Industrial Association	800 00
Grand Forks Agricultural Association	600 00
Kelowna Agricultural and Horticultural Association	600 00
Armstrong and Spallumcheen Agricultural Society	1,000 00
Slocan Lake Agricultural Association	150 00
Arrow Lakes Agricultural and Industrial Association	300 00
Needles and District Agricultural Association	200 00
Summerland Agricultural Association	400 00
Burton District Agricultural Association	100 00
Fort George Agricultural and Industrial Association	500 00
Northern British Columbia Agricultural and Industrial Association	500 00
Bella Coola Fair and Agricultural Association	100 00
Cariboo Agricultural and Horticultural Association	250 00
Total	$12,850 00
Total, 1916	$13,425 00

APPENDIX No. 27.

Expenditure in Aid of Farmers' Institutes, Year ending December 31st, 1916, and 1917.

	Year 1917.		Year 1916.	
	Total.	Average Cost per Institute.	Total.	Average Cost per Institute.
Membership allowances	$4,022 35	$27 17	$3.370 75	$23 09
Grant to Secretaries	3,493 70	23 60	2,506 18	24 01
Field-crop competitions	830 00	5 61	997 00	6 85
Short courses, spring meetings, and general lecture-work	...	...	404 00	2 76
Importation of pure-bred stock	1,539 61	10 40	2.955 77	20 24
Erection of manure-hopper at Prince Rupert	160 00	1 09	620 75	4 25
Postage, printing, and bulletins	1,606 15	10 86	629 33	4 31
Poison for "gopher" campaign	122 75	83	...	...
Advisory Board, expenses	339 50	2 29	...	...
Grants to institutes holding fairs	200 00	1 35	...	...
Miscellaneous	318 96	2 16	838 28	5 74
Totals	$12,633 02	$85 36	$15,088 69	$103 35

APPENDIX No. 28.

Farmers' Institute Meetings, 1917.

Institute.	Place of Meeting.	Date.
Islands—		
South Saanich	....	Feb. 16
South Saanich	Temperance Hall, Keating	Feb. 16
South Saanich	Temperance Hall, Keating	Feb. 17
Victoria	Agricultural Hall, Gordon Head	Feb. 19
Victoria	Agricultural Hall, Gordon Head	Feb. 19
Cowichan	Duncan	Feb. 19
Cowichan	Duncan	Feb. 19
Cowichan	Duncan	Feb. 19
Islands	Ganges	Feb. 19
Comox	Courtenay	Feb. 20
Comox	Courtenay	Feb. 21
Lower Mainland—		
Delta	Ladner	Feb. 23
Surrey	Cloverdale	Feb. 24
Chilliwack	East Chilliwack	Feb. 26
Chilliwack	East Chilliwack	Feb. 26
Chilliwack	Sardis, Chilliwack	Feb. 26
Chilliwack	Sardis, Chilliwack	Feb. 26
Chilliwack	Rosedale	Feb. 27
Chilliwack	Rosedale	Feb. 27
Maple Ridge	Hammond	Feb. 28
Maple Ridge	Hammond	Feb. 28
Mission	Mission	Feb. 28
Nicola to Salmon Arm—		
Nicola	Lower Nicola (Coyle)	Feb. 28
Notch Hill and Shuswap	Notch Hill	March 1
Martin's Prairie	Pritchard	March 1
Salmon Arm	Salmon Arm	March 2
Salmon Arm	Salmon Arm	March 2
Silver Creek	Silver Creek	March 2

APPENDIX No. 28—*Concluded.*

FARMERS' INSTITUTE MEETINGS, 1917—*Concluded.*

Institute.	Place of Meeting.	Date.
Okanagan, North—		
Spallumcheen	Armstrong	March 3
Spallumcheen	Armstrong	March 3
North Okanagan	Enderby (King Edward)	March 3
North Okanagan	Grindrod	March 3
Okanagan	Coldstream	March 5
Okanagan	Vernon	March 5
Okanagan	Vernon	March 5
Lumby	Lumby	March 10
Okanagan, South—		
Kelowna	Kelowna	March 6
Kelowna	Kelowna	March 6
Kelowna	Rutland	March 6
Kelowna	Rutland	March 6
Kelowna	Kelowna	March 7
Kelowna	Kelowna	March 7
Naramata	Naramata	March 5
Peachland	Peachland	March 5
Peachland	Peachland	March 8
Westbank	Westbank	March 8
Okanagan Centre	Woods Lake	March 7
Penticton	Penticton	March 7
Penticton	Penticton	March 8
Kaleden	Kaleden	...
Grand Forks and West Kootenay—		
Grand Forks	Grand Forks	March 8
Grand Forks	Grand Forks	March 9
Glenside	Bridesville	...
South Slocan	Passmore	March 10
Creston	Creston	March 10
Creston	Creston	March 10
Creston	Creston	March 12
Creston	Erickson	March 10
Creston	Erickson	March 10
Creston	Erickson	March 12
Harrop and Procter	Harrop	March 12
West Kootenay	Nelson	March 12
West Kootenay	Nelson	March 12
Willow Point	Willow Point	March 13
Arrow Lakes to Golden—		
Robson	Robson	March 13
Arrow Lakes	Nakusp	March 14
Arrow Lakes	Nakusp	March 14
Burton City	Burton	March 15
Needles	Needles	March 15
Fire Valley	Edgewood	March 15
Revelstoke	Revelstoke	March 16
Malakwa	Malakwa	March 16
Columbia Valley	Wapta School	March 17
Golden	Golden	March 17

APPENDIX No. 29.

EXPENDITURES IN AID OF WOMEN'S INSTITUTES, YEARS ENDING DECEMBER 31ST, 1916 AND 1917.

	YEAR 1917.		YEAR 1916.	
	Total.	Average Cost per Institute.	Total.	Average Cost per Institute.
Department grant to Secretaries	$1,475 00	$25 00	$1,475 00	$25 00
Membership allowances	1,566 75	26 56	1,361 25	23 07
Lecturers' expenses	1,349 03	22 86	165 05	2 80
Advisory Board—				
(*a.*) Salary of Secretary	480 00	8 14	480 00	8 13
(*b.*) Expenses of members	1,055 86	17 90	940 38	15 94
Flower-shows—				
(*a.*) Prizes	233 12	3 95	288 47	4 89
(*b.*) Grants	483 00	8 18	529 25	8 97
Conferences	341 60	5 79	448 31	7 60
Printing, subscriptions, etc.	1,257 94	21 32	190 86	3 24
Miscellaneous	499 73	8 47	274 20	4 64
Totals	$8,742 03	$148 17	$6,152 77	$104 28

APPENDIX No. 30.

WOMEN'S INSTITUTE FLOWER-SHOWS, 1917.

1. Hatzic	June	21
2. Lake Hill	„	29
3. Matsqui	„	30
4. Haney	July	6
5. Parksville	„	18
6. South Saanich	„	21
7. Colwood	„	25
8. Kaslo	„	27
9. Shawnigan	„	28
10. West Saanich	„	28
11. Tappen	Aug.	1
12. Agassiz	„	2
13. Kelowna	„	4
14. Langford	„	4
15. Nakusp	„	7
16. Harrop	„	8
17. Langley Fort	„	8
18. Upper Sumas	„	9
19. Willow Point	„	9
20. Central Park	„	10
21. Peachland	„	10
22. Garden City (child-welfare)	„	11
23. Mount Ida	„	15
24. Salmon River Valley	„	15
25. Penticton	„	16
26. Cranbrook	„	21
27. Tynehead	„	22
28. Kalamalka	Aug.	
29. Okanagan Centre	„	
30. Crawford Bay	Sept.	5
31. Creston	„	5
32. Garden City	„	5
33. Similkameen	„	7
34. Strawberry Hill	„	12
35. Coquitlam	„	20
36. Hazelmere	„	
37. Summerland and West Summerland	Oct.	24-25
38. Naramata	„	25
39. Rock Creek	„	25
40. Gordon Head (exhibition of women's work)	...	
41. Nelson	...	

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

PROVINCIAL MUSEUM

OF

NATURAL HISTORY

FOR THE YEAR 1917

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir FRANK STILLMAN BARNARD, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The undersigned respectfully submits the Annual Report of the Provincial Museum of Natural History for the year 1917.

J. D. MACLEAN,
Provincial Secretary.

Provincial Secretary's Office, Victoria,
March 7th, 1918.

PROVINCIAL MUSEUM OF NATURAL HISTORY,

VICTORIA, B.C., March 7th, 1918.

The Honourable J. D. MacLean, M.D.,

Provincial Secretary, Victoria, B.C.

SIR,—I have the honour, as Director of the Provincial Museum of Natural History, to lay before you the Report for the year ending December 31st, 1917, covering the activities of the Museum.

I have the honour to be,

Sir,

Your obedient servant,

FRANCIS KERMODE,

Director.

PROVINCIAL MUSEUM REPORT

FOR THE YEAR 1917.

Since the last Annual Report of the Provincial Museum it has been found that it was still necessary that the strictest economy must be exercised in the maintenance of public institutions, expending moneys only where it was absolutely necessary, and still keep up to the objects of the "Provincial Museum Act," viz.:—

(*a.*) To secure and preserve specimens illustrating the natural history of the Province:

(*b.*) To collect anthropological material relating to the aboriginal races of the Province:

(*c.*) To obtain information respecting the natural sciences relating particularly to the natural history of the Province, and to increase and diffuse knowledge regarding the same.

Although quite a large number of specimens have been added to the collection during the year, little actual field-work was undertaken, as at the usual time to start field-work it was not possible to secure the desired assistants.

However, Dr. C. F. Newcombe, who has always been only too willing to assist in building up the collections of the Provincial Museum, offered his services voluntarily, and accompanied the Director on a trip to the Bella Coola District in the month of June.

While in Bella Coola special efforts were made to collect the flora of the district, as this was particularly needed in mapping out the distribution of the different species of plants in this Province. Quite a large representative collection was secured and prepared, of which special mention is made in the botanical report. A number of plants were also collected at Ocean Falls while waiting there for a steamer to Victoria.

Advantage was also taken of the information conveyed to the Director by Mr. W. H. Gibson, the missionary at Bella Coola, that he thought it would be possible to secure a number of old ceremonial masks, which had been in possession of the tribe for a great number of years, from an old Indian chief, "Captain Schooner."

Dr. Newcombe and the Director paid several visits to the old reserve to see the old chief, and after using a great deal of diplomacy and secrecy (which is necessary when dealing with Indians in such matters, especially with chiefs), these ceremonial masks were secured with their stories and legends.

In the month of April the Department was fortunate in purchasing from Lieutenant F. C. Swannell, B.C.L.S., of Victoria, a collection of Indian relics from the Northern Interior of the Province, from which locality the Museum had very little material; these specimens belonged to a number of tribes, which, like others, are fast disappearing. Lieutenant Swannell had collected these specimens several years ago while out with survey parties in the northern portions of the Province.

Two very valuable collections of anthropological material were donated to the Museum, one by Mrs. Gertrude A. Croucher, Yale, B.C., in memory of her much respected husband, the late Rev. Charles Croucher. This collection, numbering 158 specimens, was collected by Rev. Mr. Croucher many years ago, and has been much coveted by a number of the museums of America; but the late reverend gentleman was loyal to this Province, and would not allow his collection to go out of British Columbia, and always said that at his death the specimens were to be donated to the Provincial Museum at Victoria, so that they would be accessible to students in the study of the life-history of the aboriginal races of this North-west Coast of America.

The other anthropological collection, numbering eight specimens, was donated by Mrs. Blanche Dewdney, in memory of her late husband, the Honourable Edgar Dewdney, P.C., ex-Lieutenant-Governor of the North-west Territory and ex-Lieutenant-Governor of the Province of British Columbia. In this collection will be found a valuable set of bone gambling-dice, with sticks as counters, used by the Kootenay Indians. Specimens similar to these are seldom seen in any collection of anthropology.

Early in the month of October, Professor John Macoun, F.R.S.C., Naturalist to the Geological Survey of Canada, Ottawa, who now resides at Sidney, B.C., received permission from the Director of the Geological Survey, Mr. R. G. McConnell, to present to the Provin-

cial Museum his fine collection of the Vancouver Island flora, numbering approximately 900 specimens, all named and classified. The Director undertook to transfer these specimens personally from Sidney to Victoria, so that they would be handled with the greatest care. These specimens have now been deposited in the Herbarium under the supervision of Mr. W. R. Carter, and are now available for reference to those who are interested in the study of botany.

It will be seen in the report on botany that special work has been carried out in this particular branch during the past year, with the assistance of several volunteer collectors, who have helped materially to make the Herbarium the most representative collection in the Province.

The exhibition cases of British Columbia butterflies on the second floor of the Museum have been entirely rearranged by Mr. E. H. Blackmore, of this city, in accordance with the new Check-list of the Lepidoptera of Boreal America, issued by Messrs. Barnes and McDunnough, of Decatur, Ill., in February, 1917. This list is recognized as the standard authority by the Victoria Memorial Museum at Ottawa, and also by the majority of the principal museums in the United States.

The nomenclature has undergone radical changes and the sequence of genera is entirely different to that of Dr. Dyar's catalogue of North America Lepidoptera, published in 1902, which has hitherto been followed. The style of labelling has been altered, the names being typewritten in two colours, the generic and specific names in purple and the author's name in red, thus ensuring greater legibility than was formerly the case in the old hand-written labels. The labels are also placed on the supporting pin at the same height as the insect, thereby rendering them more easily readable to the general public. It is hoped to be able to continue this work on the Museum collection of moths during the coming year.

It is very gratifying to note that a number of teachers, both in public and private schools, are bringing their classes to the Museum in connection with their nature-studies, which I am sure has been greatly appreciated by the scholars, and without doubt has been a great benefit to them individually, judging from the manner in which they have gone around the exhibition halls taking notes. The Director or one of the staff is always on hand to give the young folk all the information possible.

The number of visitors that have signed the register in the entrance hall during the year 1917 was 35,672; this does not give the number of visitors by any means, as the school-children are not asked to register their names, neither are a large number of Orientals and others.

The Director has had a number of requests from other museums, societies, and persons who are interested in the several branches of natural sciences for the loan of specimens for comparison, which has always been willingly granted whenever possible.

By permission of the Honourable Provincial Secretary, the annual meeting of the British Columbia Entomological Society was held in the Botanical Room in the Provincial Museum, when a number of very interesting papers were read by members on systematic and economic entomology.

The Honourable Minister of this Department also gave the Director permission to have the meetings of the Natural History Society held in the Museum on evenings when subjects are being discussed on natural-history specimens that are represented in the collections; this arrangement is most satisfactory, as it saves loaning specimens, and I think is of more interest to members and has been greatly appreciated by the society.

The Director wishes to extend grateful thanks to the following persons that have assisted with the identifications in their respective branches of biology:—

Identification of Botanical Specimens.—Professor J. Macoun, Sidney, B.C.; J. M. Macoun, C.M.G., Chief of Biological Department, Ottawa; C. F. Newcombe, M.D., Victoria; and Professor J. K. Henry, University of British Columbia, Vancouver, B.C.

Identifications in Entomology.—Doctors Barnes and McDunnough, Decatur, Ill.; Professor E. M. Walker, University of Toronto, Ont.; L. W. Swett, Lexington, Mass.; R. S. Sherman, Vancouver, B.C.; and E. H. Blackmore, Victoria, B.C.

Thanks are also extended to a number of persons who have donated specimens.

Botanical specimens have been received from the following: Professor J. Macoun, Sidney; W. B. Anderson, Victoria; Dr. C. F. Newcombe, Victoria; W. R. Carter, Alberni; W. A. Newcombe, Victoria; J. R. Anderson, Victoria; and Professor J. K. Henry, Vancouver.

Notes on bird observations have been received from the following: J. E. Kelso, M.D., and W. B. Johnson, Lower Arrow Lakes; A. H. Palmer, New Westminster; J. A. Munro, Okanagan Landing; and others.

BARE ISLAND BIRD SANCTUARY.

(This island is known as Indian Reserve No. 9, Saanich Tribe, and is situated in Haro Strait about twenty miles north-east of Victoria.)

Owing to certain conditions it was not deemed advisable to place a warden on this island during the last nesting season, and it was expected that after this island had been guarded so closely for the two previous seasons, and persons warned to keep away, no person would go there to molest the gulls, guillemots, puffins, and cormorants that make this island their nesting ground.

But in a report that was sent to me by Mr. Leonard S. Higgs, who lives on one of the neighbouring islands, it seems imperative that a guard must be maintained on Bare Island during the nesting season and continued indefinitely. The following is a quotation from his letter:—

"As perhaps you know, I take a deep interest in the few sea-bird breeding-places in the neighbourhood, and especially in that on Bare Island, which I have visited practically every summer for twenty-five years.

"The policy of the Government in placing a warden on Bare Island for a couple of months during the breeding-season was admirable, and was responsible for raising the number of breeding pairs to at least double what it was two or three years ago. But it is a policy which should be continued indefinitely.

"My experience this summer has been as follows: I visited the island early in June, when the nests were just made, and contained either one or two eggs. I counted over 100 eggs in an area perhaps equal to one-thirtieth of the breeding-ground, taking an average of one egg and a half to each nest at that time. When the full hatches should have been laid, the number of eggs available for hatching should have been 6,000. I called again after an interval of ten days, and should have had difficulty in finding 100 eggs upon the entire island, practically every nest being empty. No bird, however prolific, can stand such treatment."

ANTHROPOLOGY.

Accessions, 1917.

By Purchase from Lieutenant F. C. Swannell (Nos. 2912-2964).

1. Athabascan. From the Northern Interior of British Columbia. This portion of the collection consists of 100 specimens which were acquired by Lieutenant Swannell at the following localities: Lac la Hache, Chestalla Lake, Fraser Lake, Stuart Lake, Stella Lake, and the Babine River country. It consists principally of articles of stone, such as arrow and spear points, knives, chisels, skin-scrapers, hammers, pipes, and a polished mirror. There are also snow-shoes, bone skin-scrapers, adzes, fish-spears, knives with iron blades, and birch-bark baskets.

2. Salishan. From Lillooet seventeen specimens include a two-handed stone pile-driver of the rare type, illustrated in last year's report. There are also a few specimens from the Lower Fraser River, Victoria, and the Bella Coola region belonging to this stock.

Rev. C. Croucher Collection, mostly from Yale, B.C. (Nos. 2979-3137).

2996 to 2999 and 3137. A remarkable set of carved stone dishes. Of these, No. 2996 is of soapstone in a very fine state of preservation. Like Nos. 2998 and 3000, it represents a seated human figure. No. 2997 is of bird form, and 2999 closely resembles a turtle. No. 3137 is a very large, crudely carved object of animal form.

There are also four small figures of human shape, and a knife-handle of horn, boldly carved to represent certain ancestors of its Indian maker.

The rest of the collection includes stone dishes (some of cigar-holder shape), a stone labret, and a great number of stone chisels, hammers, arrow-points, etc.

Collection presented by Mrs. Dewdney on behalf of the late Edgar Dewdney (Nos. 2904 to 2911).

2904. Salish. Medicine-man's head-dress of two paws of grizzly bear with claws.

2905. Gambling set of four long polished bone, marked with diagonal and circular lines. Set of twelve sticks for counting. Kootenay.

2906. Salish. Spindle-whorl of big maple, carved to show two thunder-birds.

2907. Salish. Tension-ring of wood, a carved bird with ring below, used to cause tension while spinning. Lower Fraser.

2908. Salish. Two mat-creasers of maple, used when making rush mats. Lower Fraser.

2909. Salish. Halibut-hook of hemlock wood, U-shaped, bone barb, spruce-root wrapping lanyard of twisted gut. Lower Fraser.

2910. Salish. Stone chisel. Lower Fraser.

2911. Salish. Spoon of mountain-goat horn, the carved handle riveted to bowl; raven below holding inverted man.

Bella Coola Collection.

From Chief Schooner were purchased the following ceremonial objects:—

1. Nos. 2965 to 2973. Masks used at potlatches and dances and representing crests and legends of the chief's clan.

2965. Eagle mask (TsElkt).

2971. Loon Mask (Squsin). This crest was also observed in the graveyard.

2972. Setting-sun mask (Nothokomai). This is now the property of Schooner's son. It is shown at potlatches over a screen at the back of the dance-house, the wearer himself being out of sight.

2973. Eagle mask. This is one of the chief's principal family crests, and is shown at the same time as—

2969. Raven mask (Qoaxmanikwulla).

2966. Killer-whale mask (Suit). A large mask in three parts which represent the head (enq), the dorsal fins (qutleik), and the tail (sliamont). The story relating how this crest came into the chief's family is, in part, as follows:—

In far-distant days Schooner's ancestors lived in a large chief's house in the sky. The first of them of whom there is still any tradition was named Tamaltsen. This man when he danced used two masks, the eagle and the killer-whale. These were obtained by him at an old village named NuskElste, a place half-way up the River TEintz, which runs past Bella Coola. Of this place it is said that at one time the sea rose so high that it filled up all the streams and reached the tops of the mountains to the west of Bella Coola, driving out all the natives from their houses until they could climb no higher. Just in time to save them from extermination a huge killer-whale swam close up to their last place of refuge on the mountain-tops and most of the people were able to climb inside and so were saved. The whale was as large as a big house and here all were cared for until the waters subsided. When land was seen once more the raven flew up and down croaking joyfully that so many people had escaped from drowning.

2967, 2968. Small masks representing two of the people who were saved.

2. Nos. 2974 to 2976. Masks used in the cannibal winter dance. These are all bird masks with long narrow beaks differing slightly in certain details, and all are called Hauhau, the Bella Coola form of the Kwakiutl Hohok. These are only parts of a complete set belonging to the winter dance, but supplement specimens purchased at Bella Coola some years ago. It was then found impossible to obtain from any one owner a perfect series such as belong to several Kwakiutl chiefs. Chief Schooner's consent had to be obtained in every instance, and he also promptly annexed a large part of the purchase-money, without opposition from the seller. It was stated that outlying parts of the set used in the cannibal dance were held by different individuals belonging to the society and were liable to be called for.

Schooner said that his family came into possession of the cannibal dance in early days. One of his ancestors was walking along the beach near Bella Coola when suddenly there appeared rising out of the sea a large chief's house. Some people came to the door and invited him to go inside. Here he saw, sitting at the far end of the house, a chief whose name was Qomoqoya, who was wearing a ceremonial hat of great size. The visitor at once produced a valuable "copper" and presented it to Qomoqoya.

Two of the ancestor's brothers had been made prisoners and taken to this house, but soon after were drowned. For this reason the use of the cannibal masks was explained to him and the right to use them was granted.

PLATE I.

NOCTUIDÆ NEW TO BRITISH COLUMBIA.

Ufeus electra Sm.
Victoria, B.C. (Blackmore).

Sideridis rosea Harv.
Rossland, B.C. (Danby).

Polia nugatis Sm.
Lillooet, B.C. (Phair).

Lasionycta rainieri Sm.
Lillooet, B.C. (Phair).

Tholera americana Sm.
Lillooet, B.C. (Phair).

Euxoa ochrogaster race *insignata* Walk.
Victoria, B.C. (Blackmore).

Autographa nichollæ Hamp.
Rosedale, B.C. (Blackmore).

Euxoa cinereopallida Sm.
Lillooet, B.C. (Phair).

Chytolita morbidalis Gue.
Cloverdale, B.C. (Blackmore).

Bomolocha abalienalis Walk.
Rosedale, B.C. (Blackmore).

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The house was named Nuskoahltnaixsta. Certain important chiefs in it were Smaiyakila, the head; SixsEkilaixla was a brother of the last; Atlkuntan and Nunatsonajen were also big chiefs and rulers. These were the spirits who presided over the cannibal dance.

2977. Storage-box (Pilkwa). This is a Bella Bella box.

2978. Spindle-whorl. Bella Coola.

BIRDS AND MAMMALS.

During the early part of the year a collection of bird-skins numbering 68 and mammal-skins numbering 154 were purchased from Mr. J. A. Munro, of Okanagan Landing; these skins are prepared in a most satisfactory manner, a number of them being collected in the Nicola District, from which the Department had very few specimens, thus making them very valuable in mapping out the distribution of species.

The Provincial Game Warden at Vancouver sent to the Museum two skins of wapiti, which had died while being transferred from the Colony Farm to be turned out in the Lillooet District. These animals were unfortunately badly skinned—in fact, ruined entirely for mounting purposes.

The raccoon group (*Procyon lotor*) in a wild crab-apple tree, which have been mounted for a great number of years and had become very much worn and faded, have been replaced by three good specimens, presented by Mr. J. N. Evans, Duncan, B.C.

The Museum was also fortunate in having a (albino) squirrel, "Vancouver Island Chickaree" (*Sciurus hudsonius vancouverensis*), presented by Mr. W. Fairall, which he shot on the Malahat, west side of Saanich Inlet, September 16th, 1917.

ENTOMOLOGY.

By E. H. Blackmore.

The weather conditions of the past season were very similar to those of the previous year, a very wet spring and early summer being followed by a dry hot spell which extended until late in September.

Throughout the valley of the Lower Fraser, the Coast District, and Vancouver Island the heavy rains of the early spring were continued on and off until the end of June. To those insects that in the pupal state pass the winter underground an abnormally heavy rainfall does a great deal of damage, causing many of the pupæ to rot, thereby reducing the number of individuals of those species. It also delays the appearance of many other species which, when they do emerge, are quickly killed off by the cold wet weather. On account of these conditions collecting in the early part of the season was exceedingly poor.

The late summer and early fall were very dry and warm, the sunny days being practically continuous for nearly three months. This continued hot weather brought out in greater numbers species which as a rule are rather scarce.

There was a rather severe outbreak of cutworms in the Victoria and Vancouver Districts during the month of May and the early part of June. A great deal of damage was done to small gardens and cultivated lots; in some instances whole beds of garden produce were completely devastated. The chief offenders were the dingy cutworm (*Feltia ducens* Walk.), the glassy cutworm (*Sideria devastator* Brace), and the caterpillars of *Euxoa messoria* Grote, *Euxoa excellens* Grote, and *Feltia vancouverensis* Grote. This latter species has not hitherto been considered of much economic importance, but I am convinced that it does as much damage as any of the others, with the possible exception of *Sideria devastator*.

During September a particularly bad infestation of shade and ornamental trees occurred in Victoria. This was caused by the larvæ of an undetermined species (*Tenthredo sp.*) of sawfly. In normal years they confine their ravages to the Lombardy poplar (*Populus dilatata* Ait.), which is their natural food-plant, but this year they occurred in such countless numbers that they attacked everything in sight, even invading houses and office buildings. The larvæ when full grown measure from 1¼ to 1½ inches in length and are of a brilliant yellow colour marked with round black spots on each segment. They are generally mistaken for the caterpillars of moths or butterflies, but they can always be distingushed by the fact that they have from six to eight pairs of prolegs; the false legs situated behind the three pairs of genuine legs near the front end of the body, while lepidopterous larvæ never have more than five pairs.

LOWER FRASER VALLEY DISTRICT.

At the request of the Director I made a three-weeks' collecting trip through this district, starting on June 11th and returning July 2nd. Taking into consideration the remarkable scarcity of insects in general up to the end of June, and also the number of wet days that occurred, the total amount of insects taken was very satisfactory; out of a total of nineteen days' actual collecting, there were six days of heavy rain, three days dull and cloudy, and ten days of bright sunshine.

On the rainy days, beating for Geometridæ and searching for Coleoptera was undertaken in the daytime, and at night collecting noctuids by "light" was successful. It was noticeable that more moths came to "light" on the wet nights than on those nights which had been preceded by a bright sunny day.

The localities visited were Vancouver, Cloverdale, and Rosedale. The Vancouver District was not at all productive, although trips were made to all the chief collecting-grounds, including Cauldfield (nine miles west of North Vancouver, on the P.G.E.), the famous Lynn Valley, Stanley Park, and South Vancouver, including the Eburne District.

Three days were spent at Cloverdale, twenty-five miles east of Vancouver, where some good material was taken, including some very interesting geometers taken while "dusking." The best district of all from a collecting point of view was certainly at Rosedale, where some valuable material was taken, some of it new to British Columbia.

Rosedale is situated at the apex of the valley, being about eighty miles from Vancouver, and is on the south side of the Fraser River (nearly opposite to Agassiz, at which place the fine Experimental Farm belonging to the Dominion Government is situated). It is heavily timbered on the north side, but skidways belonging to the shingle-mills in operation there furnished a convenient means of getting into the heart of the woods.

Mount Cheam, rising to a height of 6,925 feet, is situated about two miles away and is a magnificent sight when the rays of the setting sun strike its rugged peaks. An ascent of this mountain was contemplated, as some very desirable alpine species are known to occur there, but owing to the great depth of snow on the trails this was found to be impossible; in some places the snow was estimated as being from 30 to 40 feet in depth; three fresh falls of snow occurred during the nine days spent there. I found out from some of the inhabitants that the ascent to the top cannot be undertaken until the last week in July on account of the snow, and then it is only possible for about three or four weeks.

The total number of insects taken on the trip was 883, made up as follows: Lepidoptera, 589; Coleoptera, 72; Hymenoptera, 105; Diptera, 102; and Odonata, 15. The Lepidoptera were comprised of the following: Butterflies, 55; moths (other than geometers), 170; geometers, 272; and Microlepidoptera, 92.

The nomenclature used is that contained in Messrs. Barnes and McDunnough's Check-list of Lepidoptera of Boreal America, which has been adopted by the Museum, and which will be followed in all future Museum publications.

The scarcity of butterflies seen on the trip was very noticeable, a short series of *Pontia napi marginalis* Scud. being taken, while *Parnassius clodius claudianus* Stich. was captured at North Vancouver and at Rosedale. These were the only two species worthy of mention. Amongst the noctuids a nice series of both *Acronycta hesperida* Sm. and *A. oblinata* A. & S. were taken, most of them being newly emerged. Three specimens of that very desirable species *Autographa nichollæ* Hamp. were taken at "light" at Rosedale. Other species of interest were: *Polia lubens glaucopis* Hamp; *Luperina passer* Gue.; and *Hyppa xylinoides* Gue. In the subfamily *Hypeninæ* a number of specimens were taken, including a good series each of *Chytolita morbidalis* Gue. and *Hypena humuli* Harr. Three female specimens of *Bomolocha palparia* Walk. were captured at Rosedale; these are, to my knowledge, the first of this sex recorded for British Columbia, although I took a male specimen at Goldstream on June 16th, 1915; this was figured in the Report of the Provincial Museum, 1916, Plate VII.

A fine male specimen of *Bomolocha abalienalis* Walk. was taken at Rosedale on June 25th. This has never been recorded previously from British Columbia, and is an inhabitant of the Eastern and Middle States.

A nice collection of Geometridæ was made, including a single specimen of *Hydrelia albifera* Walk., at Rosedale on June 26th; this is the first authentic record of this species west of Kaslo.

Other desirable species taken at various localities in the valley were: *Cosymbia lumenaria* Hbn.; *Calocalpe undulata* Linn.; *Dysstroma occidentata mutata* Taylor; *Xanthorhœ designata emendata* Pears; *Euphyia multiferata* Walk.; *Epirrhœ alternata* Mull.; *Eupithecia casloata* Dyar; *E. castigata* Hub.; and *Metanema quercivoraria* Gue.

Amongst the micros two of particular interest are *Pyrausta ochosalis* Dyar, taken at Cloverdale (only previous record from Kaslo), and *P. funebris* Strom., captured at Rosedale.

The Coleoptera and Hymenoptera have not been worked over as yet, but some work has been done on the Diptera, many of which, however, await further determination.

Odonata (Dragon-flies).

A small collection of about forty specimens were recently submitted to Dr. E. M. Walker, of Toronto, for identification. They comprised seventeen species, three of which, it is pleasing to note, are species that have not previously been recorded from British Columbia, viz.:—

Cœnagrion resolutum Hagen. One female taken by W. A. Newcombe at Chilcotin on June 25th, 1915.

Leucorrhinia intacta Hagen. Two males taken by J. A. Munro at Okanagan Landing on July 6th, 1916, and one male taken by W. R. Carter at Alberni on July 29th, 1915.

Leucorrhinia borealis Hagen. One male taken by W. A. Newcombe at Chilcotin on June 22nd, 1915.

Hereunder we publish a list of the remaining fourteen species, with their localities, and hope at some future date to give a complete list of the Odonata of British Columbia, an order which has hitherto been somewhat neglected:—

Enallagma calverti Morse. Vancouver (E. H. Blackmore).
Enallagma cyathigerum Charp. Chilcotin (W. A. Newcombe); Cranbrook (C. Garrett).
Enallagma carunculatum Morse. Alberni (W. R. Carter).
Æshna interrupta nevadensis Walker. Quesnel Forks (Newcombe).
Tetrageneuria spinigera Selys. Alberni (Carter).
Cordulia shurtleffi Scudd. Vancouver (Blackmore); Cranbrook (Garrett).
Libellua quadrimæulata Linn. Cranbrook (Garrett).
Libellua lydia Drury. Cloverdale (Blackmore); Rosedale (Blackmore).
Sympetrum scoticum Donovan. Quesnel Forks (Newcombe).
Sympetrum costiferum Hagen. Okanagan Landing (Munro).
Sympetrum decisum Hagen. Okanagan Landing (Munro).
Sympetrum obtrusum Hagen. Okanagan Landing (Munro).
Leucorrhinia glacialis Hagen. Okanagan Landing (Munro).
Leucorrhinia hudsonica Selys. Vancouver (Blackmore); Cranbrook (Garrett).

Rare and Uncommon Insects taken in British Columbia during 1917.

Under this heading we propose to give a list of the rare and uncommon insects which have been taken during the past season at various localities in the Province of which we have any knowledge. Properly authenticated records of these insects from any collection in the Province will be gladly welcomed. It is hoped by this means to get a better knowledge of the distribution and geographical range of our lesser-known species, which in some instances may eventually prove of great economic value.

Victoria.—During the past season the writer, with the assistance of Mr. Edward Cooke and Mr. Arthur Robinson, of this city, has been fortunate in taking many desirable species of noctuids and geometrids.

From a pupa found in the city park I bred a splendid female specimen of *Smerinthus cerisyi opthalmicus* form *pallidulus* Edw. This is a very rare form and is new to British Columbia. The ground colour is of a beautiful pale fawn, in contradistinction to the dark olive-brown colour of typical *opthalmicus*. Amongst the noctuids taken were the following uncommon species: *Euxoa intrita reuda* Streck; *E. terrena* Sm. (very rare); *E. divergens* Walk.; *E. atrifera* (rare); *Matuta apposita* Grt.; *Eriopyga infidelis* Dyar; *Eurotype contadina* Sm.; *Eumichtis loda* Streck; *Septis antennata purpurissata* B. & McD. (rare); *Trachea cinefacta* Grt.; *Ufcus electra*, Sm.; *Luperina passer* Gue. (rare); and *Autographa ampla* Walk. This latter is the first record from Victoria that I know of, although it has previously been taken at Duncan and Wellington.

Several interesting specimens were taken amongst the Geometridæ, including two new to the Province—viz., *Venusia duodecemlineata* Pack. and *Eupithecia borealis* Hlst. The former was taken at rest on an electric-light pole by the writer in April. It is closely allied to *V. pearsalli* Dyar (which is one of our commonest spring species), but can be distinguished by its generally darker colour and the wavy extra-discal line on the forewings. The latter was taken at "light" by Mr. A. Robinson on June 27th, and another specimen was taken by Mr. W. Downes at Oak Bay on the 30th of the same month. This species was originally described from Manitoba.

The other geometers of more than passing interest were: *Lobophora nivigerata* Walk.; this has been an exceedingly rare species until this year, when we had the good fortune to take half a dozen specimens; *Cosymbria dataria* Hlst.; *Calocalpe undulata* Linn.; *Nematocampa limbata* Haw. As recorded in last year's Annual Report, this pretty little geometer had not been recorded from this district for twelve years until 1916, when two specimens were captured at "light." This season a special look-out was kept, with the result that a nice series of eleven specimens were taken. It is evidently very local. *Metanema inatomaria* Gue.; a single specimen was taken at "light" in the same locality as the one taken last year. *Pero occidentalis* Hulst.; two males were taken on June 4th and 7th respectively. This is a very interesting record, as it is rather a rare species and not previously known west of Penticton.

We have specimens from the latter locality and also from Rossland. The *Azelina occidentalis* Hulst., given as "generally distributed" in the 1906 Check-list of British Columbia Lepidoptera, is an error, as the species there referred to is *Pero giganteus* Grossb., which has a known range from Vancouver Island to Kaslo. The chief determining character of *occidentalis* is the dentate antennæ of the male; in the other three species of *Pero* which occur in British Columbia the antennæ are filiform in both sexes.

Mr. W. B. Anderson, Inspector of Indian Orchards, took a single specimen of *Neptyia phantasmaria* Streck in September. This is also an interesting record, as this, together with one taken by the writer in September, 1915, constitutes the only known records of this species in Victoria.

The same collector also took a specimen of *Hæmorrhagia diffinis rubens* Hy. Edw. in his garden at Oak Bay in September. This species is single-brooded and flies about the first week in May; the most probable explanation is that the cocoon, which is generally spun up under fallen leaves, was lying in an exposed place subject to the direct rays of the sun, and consequently brought to maturity at the end of the summer instead of lying dormant until the following May.

The following noctuids, collected by Mr. W. Downes, of Oak Bay, are worthy of mention: *Euxoa catenula* Grt. (new to this district); *E. esta* Sm. (rare); *Polia lubens glaucopis* Hamp.; *Septis multicolor* Dyar (rather rare); *Trachea finitima cerivana* Sm.; and *Autographa celsa* Hy. Edw. He also took a short series of *Eupithecia obumbrata* Taylor on Mount Tolmie in May. This is the first record of this species in Victoria. It is evidently a mountain form, as it has been taken by Mr. Day on Mount Tzouhalem, near Duncan, and also on the mountains at Goldstream.

I nearly forgot to mention that a school-boy captured a specimen of *Pseudohazis eglanterina* Bdv. (the sheep-moth) near the Ross Bay Cemetery. This is the first record of this species that we have from Victoria; it occurs sparingly at Goldstream, Shawnigan, and Duncan.

Goldstream.—On one of the writer's occasional trips to this locality a number of noctuid moths were taken after dark feeding on a large patch of cultivated sunflowers, amongst which were specimens of *Euxoa esta* (rare); *E. tessellata tesselloides* Grt.; and *Rhynchagrotis rufipectus* Morr. On another occasion a beautiful specimen in perfect condition of *Cleora excelsaria* Streck was taken. This is the first capture of this exceedingly rare geometer that has been recorded for about thirteen years. It was taken at rest on a fire-blackened tree-trunk early on the morning of June 4th. An extensive search for further specimens was made, but no others were seen.

A nice series of *Perizoma costiguttata* Hulst. was obtained on the 3rd and 4th of the same month; this species is evidently very local in its habits.

Duncan.—Mr. G. O. Day, of Quamichan Lake, has succeeded in breeding a short series of that uncommon deltoid *Bomolocha toreuta* Grt. The larvæ were found feeding on dogwood in

August of 1916, and the adults emerged at the end of the following May. This is a valuable record, as the knowledge of the food-plants of a great many of our species is very limited.

It is also interesting to note that Mr. Day also took a fine specimen of *Venusia obsoleta* Swett on April 18th. This species was described last year from specimens found in the Harvey and the Museum collections taken in 1908, and was figured in the Provincial Museum Report for 1916 on Plate VIII.

Mr. A. W. Hanham, also of Quamichan Lake, took a beautiful geometer on June 20th, which turned out to be *Stamnoctenis morrisata* Hulst., a species which was described from Arizona and is entirely new to our fauna.

Cumberland.—A few specimens of *Cercyonsis alope ariane* Bdv. were taken in this district in July. This is noteworthy as no species of this genus has ever been recorded from Vancouver Island before. *Boopis* Behr., a form of *ariane* with fewer spots on the under-side, occurs in the Interior from Lillooet to Cranbrook.

Savary Island.—Mr. R. S. Sherman, of Vancouver, who spends his annual vacation on this island, reports that he has seen specimens of *Danaus archippus* Fabr. (the milkweed butterfly) there every year for several years, and that this year he found several patches of milkweed growing there. As this is the natural food-plant of *archippus*, the probabilities are that it breeds on this island, but this fact will have to be proved before it can be accepted as such. This butterfly has a cosmopolitan range, but has not been known to breed in British Columbia, although occasional specimens have been taken in various parts of the Province. He also mentions that *Epargyreus tityrus* Fabr. (the large silver-spotted skipper) was very common in July. It has been previously recorded from Vancouver and doubtfully from Glacier.

Cloverdale.—Mr. Bevan L. Hugh, who collected a number of geometers during the past season, captured a specimen of *Philobia ulsterata* Pearson. This is an exceedingly rare geometer, and is the first taken to my knowledge since 1908, when the late Mr. A. H. Bush took one in Vancouver. Amongst others taken by the same collector was a nice series of *Spargania magnoliata pernotata* Hulst. and a fine specimen of *Selenia alciphearia ornata* B. & McD.

Quesnel Forks.—While engaged on business connected with the Provincial Fisheries Department in this district in late August and September, Mr. W. A. Newcombe, of Victoria, collected a few insects which proved of great interest, as we had not received any material from this particular district previously. The butterflies taken were *Phyciodes campestris* Behr.; *Polygonia progne* Cram.; and *Aglais J.-album* Bdv. & LeCon.

A short series of *Hypoprepia miniata* Kby. (the scarlet-winged lichen-moth) was obtained; this has previously been recorded from Kaslo. The Noctuidæ comprised *Euxoa mimallonis gagates* Grt.; *Graptolitha georgii* Grt.; *Catocala briseis* Edw. (previously recorded from Kaslo); *Autographa rectangula* Kirby; and *Scoliopteryx libatrix* Linn. The geometers proved scarce, only three species being taken, viz.: *Lygris xylina* Hulst.; *Hydriomena furcata* Thun; and *Ceratodalia gueneata* Pack.

Lillooet.—In the beginning of August Mr. A. W. A. Phair took two or three specimens of a bright coppery-red butterfly which we identified as *Heodes cupreus* Edw. It was taken at Mount McLean at an altitude of 7,000 feet, and is a new record for British Columbia. It is very closely allied to *H. snowi* Edw., which also occurs in British Columbia, but is very rarely taken; *cupreus* is brighter in colour and more heavily spotted than *snowi*. He has kindly donated a pair for the Museum collection.

Mr. Phair, on a recent visit to Victoria, brought with him a large amount of material for identification; as many of the noctuids were new to us, we sent them to Dr. J. McDunnough for determination, with the result that many of them proved new to British Columbia, and materially add to the known lepidopterous fauna of this Province.

The following is a list of those new to British Columbia: *Euxoa cinereopallida* Sm.; *Agrotis piscipellis* Grt.; *Rynchagrotis vittifrons* Grt.; *Lasionycta rainieri* Sm.; *Polia nugatis* Sm.; *Polia farnhami* Grt.; *Tholera americana* Sm.; and *Cerapoda oblita* Grt. Amongst the others were some very desirable species, the following being of special interest as extending our knowledge of their known range; *Euxoa satiens* Sm.; *E. murdocki* Sm.; *Lasiestra phoca luteola* Sm.; and *Pseudanarta flava* Grt.

NEW BRITISH COLUMBIA LEPIDOPTERA.

Under this heading we publish an annotated list of those new species and varieties which have been described during the past season. We believe that this list will be of value to those entomologists in the Province who are unable to keep in touch with all the current literature on the subject, but who are desirous of keeping their collections and check-lists up to date in nomenclature and scientific arrangement.

Glaucopsyche lygdamus columbia Skin. This new race of *lygdamus* was described by Dr. Henry Skinner in the Ent. News for May, 1917. The type and paratypes are from Port Columbia, Wash. Amongst other localities mentioned for this species is Corfield, Vancouver. We presume this is meant for Corfield, near Duncan, on Vancouver Island. This pretty blue butterfly is fairly common all over the Island about May, and has been going under the name of *G. lygdamus behrii* Edw. (*vide* Report, Provincial Museum, 1916). The true *behrii* is a California race of *lygdamus*, with San Francisco as its probable nimotypical locality; *columbia* differs from *behrii* in being of a much deeper shade of blue and the spots on the under-side of the wings being larger.

In Vol. III., No. 4, Cont. Lept. No. Amer., March, 1917, Messrs. Barnes and McDunnough describe a number of new species and varieties of Geometridæ, amongst which are eight new to British Columbia. As these "Contributions" were published subsequent to the issuance of their new check-list, the following additions must be made to it:—

Trichodesia albovittata tenuifasciata B. & McD. This form was described from Spirit Lake, Idaho. In the Barnes collection there were specimens from Wellington, B.C., and the writer has a specimen taken by Mr. W. H. Danby at Ymir in 1900. In this variety the white band of primaries is much narrower, being only 1 mm. in width.

Thera georgii benesignata B. & McD. This racial name has been given to the Vancouver Island form on account of its larger size, paler colour, and the strong contrast between the brown median and basal areas and the ground colour. Typical *georgii* is now restricted to the Nevada species. The types of *benesignata* are from Wellington and the paratypes from Duncan.

Mesoleuca gratulata latialbata B. & McD. Described from three specimens from Plumas County, Cal. In this form the median white band is strongly constricted centrally below the cell, due to an outward bulge in the dark basal area and a strong inward bend below vein 4 of the outer dark area. I have a specimen from Kaslo which Dr. McDunnough considers this form, although the basal line is not quite typical.

Epirrhœ plebeculata vivida B. & McD. This is the species hitherto known as *Rheumaptera rubrosuffusata* Pack., which occurs commonly throughout the Island and Lower Mainland. *Rubrosuffusata* has been found to be a synonym of *plebeculata*, which was described by Guenee, from California, and the racial name of *vivida* is proposed for our Vancouver Island form on account of the coloration being much better defined.

In describing a new species, *Phasiane ponderosa*, Messrs. Barnes and McDunnough mention a variety of it under the form name of *demaculata*, in which the cross-lines tend to become obsolescent, especially in the females. The types are from Calgary, Alta., but one of the female paratypes is from Field, B.C. We have two rather worn females, one from Atlin, taken by E. M. Anderson, and one from Chilcotin, taken by W. A. Newcombe, so that although uncommon it is widely distributed.

Itame plumosata B. & McD. This pretty yellow and brown geometer was described from specimens taken in various localities in Arizona and Utah. We have a male specimen from Mount McLean near Lillooet, taken in July, 1916, by E. M. Anderson. It is rather remarkable that this species should turn up here, as it is a long way from its nimotypical locality; it is apparently a high altitude species and may turn up on any of the high mountains in the intervening country.

Cleora satisfacta B. & McD. Described from one male and one female taken at Kaslo. This is closer in general habitus to *excelsaria* Streck and *albescens* Hulst. than to any other *Cleora* that occurs in the Province.

Æthaloptera anticaria fumata B. & McD. This is the insect from Kaslo that has been previously known as *Æ. intextata* Walk. Dr. McDunnough states that *anticaria* should be used for the common Eastern species instead of *intextata*, and proposes the name of *fumata* for the

PLATE II.

GEOMETRIDÆ.

Cleora excelsaria Streck.
Goldstream, B.C. (Blackmore).
(Very rare.)

Stamnoctenis morrisata Hulst.
Duncan, B.C. (Hanham).
(New to British Columbia.)

Xanthorhœ blackmorei Swett.
(Paratype male.)
Victoria, B.C. (Blackmore).
(New to science.)

Xanthorhœ blackmorei Swett.
(Paratype female.)
Victoria, B.C. (Blackmore).
(New to science.)

Xanthorhœ macdunnoughi Swett.
(Allotype female.)
Victoria, B.C. (Blackmore).
(New to science.)

Xanthorhœ atlinensis Swett.
(Paratype male.)
Atlin, B.C. (Anderson).
(New to science.)

Philobia ulsterata Pears.
Cloverdale, B.C. (Bevan Hugh).
(Very rare.)

Lygris destinata race *schistacea* Warr.
Kaslo, B.C. (Cockle).
(New to British Columbia.)

Itame plumosata B. & McD.
Armstrong, B.C. (Downes).
(New to British Columbia.)

Drepanulatrix carnearia Hulst.
Rossland, B.C. (Danby).
(New to British Columbia.)

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Kaslo race, which is more evenly suffused with smoky brown and with the lines more or less obsolescent. The types are six males from Kaslo, presumably taken by Mr. J. W. Cockle. This locality is the only one from which we have any record of this species.

In addition to the foregoing, it is as well to note that Messrs. Barnes and McDunnough have given the study of *Sicya macularia* Harris and its various races considerable attention, with the result that *crocearia* Pack. is rescued from the synonymy and applied to the form that occurs in the Great Basin Region of the United States, and also to a similar form occurring on Vancouver Island. For the benefit of those collectors who may think that they have two different varieties of this species, it is as well to add that this form is sexually dimorphic. In a long series taken by the writer it is noticeable that while the females in general are much scarcer than the males, the dimorphic female is far more prevalent than the typical one.

In Cont. Lep. No. Amer., Vol. IV., No. 1, May, 1917, Messrs. Barnes and McDunnough have revised the whole of the genus *Hydriomena*. Many radical changes have been made and new species added, some of which refer to our British Columbia forms, so that it will be advisable for collectors to alter their check-lists accordingly.

Hydriomena albifasciata victoria B. & McD. This has always been listed as *reflata* Grt. in British Columbia collections, but this name has been restricted to an Arizona race of *albifasciata*, and the name *victoria* has been given to the Vancouver Island form; the types being three males and two females from Victoria.

Hydriomena exculpata tribulata B. & McD. This is a grey form of *exculpata*, a new species described from Ketchikan, Alaska. The localities given for the form *tribulata* are Oregon, Colorado, and Kaslo, B.C.

Hydriomena perfracta exasperata B. & McD. The race *exasperata* was described from two specimens taken by the late Rev. G. W. Taylor, one at Departure Bay, near Nanaimo, and the other at Wellington. It is evidently very rare. One male specimen was taken by the writer at Victoria on May 19th, 1914.

Hydriomena renunciata columbiata form *pernigrata* B. & McD. The types of this form came from Glacier National Park, Montana; the paratypes, one male and one female, from Skagit Basin, B.C.; and one male from Stikine River, B.C. The latter probably collected by Theodore Bryant, of Ladysmith, who collected in that district when with a survey party.

Hydriomena edenata grandis B. & McD. The racial name of *grandis* has been given to our Vancouver Island form, which has been previously known as *edenata* Swett. Typical *edenata*, which was described from Eden Valley, Monterey County, Cal., is very much smaller than the one we get here and is shaded with a warm brown, while our form is tinged with green.

The genus *Xanthorhœ*, which contains several distinct groups of species, has been badly mixed up in the past, and much misidentification of species has ensued.

As it was also felt that there were several species, or at least good varieties, going under the same name, the writer collected extensively in this genus for several years, with the result that Mr. L. W. Swett, the well-known geometridist, described several new forms of the *defensaria* group, which were illustrated in the Annual Report of the Provincial Museum for the year 1915, Plate VII., Figs. 5 to 12.

In the *pontiaria-fossaria* group Mr. Swett has just described the following three new species in the Can. Ent., Vol. 50, No. 1, p. 17 *et seq.*:—

Xanthorhœ macdunnoughi Swett. This occurs all over the southern portion of Vancouver Island, but it is not common by any means. The types are from specimens taken by the writer at Victoria. Paratypes of each sex have been placed in the Museum collection.

Xanthorhœ atlinensis Swett. This species was taken at Atlin by E. M. Anderson in 1914, and was described from eight specimens, all male. It is close to *fossaria* Taylor, which was described from Mount Cheam. Paratypes are in the Museum collection.

Xanthorhœ blackmorei Swett. Described from material taken by the writer at Goldstream and Victoria. This species is very distinct, as in most cases the blackish median band becomes obsolescent below the median vein. A male paratype has been placed in the Museum collection. Illustrations of these new species will be found in an accompanying plate.

BOTANY.

During the season of 1917 there have been numerous accessions to the Herbarium of the Provincial Museum, notably the presentation of a large collection of plants of Vancouver Island,

collected, mounted, and named by Professor John Macoun since he has resided at Sidney, B.C., together with a collection of Musci and Lichens made by him on Vancouver Island and a portion of the Mainland of this Province. This collection, made and named by so eminent a botanist, will be a valuable acquisition as a source of reference in the identity and for determination of other specimens.

Mr. W. B. Anderson, of Victoria, has contributed a large number of plants, collected in his leisure hours, from the Interior, which cover many localities, from Fort George to Penticton and extending through West Kootenay. This collection will undoubtedly add much new material to the Herbarium, especially as regards distribution.

The Fort George specimens cover a new area not hitherto represented in the collection. A few of the plants from the various localities mentioned are as follows:—

Chenopodium botrys.
Axyris amarantoides.
Calochortus elegans.
Melampyrum lineare.
Anemone virginiana.
Chrysothamnus nauseosus.
Chimaphila menziesii.
Antennaria rosea.
Anthriscus sativa.
Gilia aggregata.
Physostegia parviflora.
Orthocarpus luteus.
Potentilla flabelliformis.
Galeopsis tetrahit.
Crepis tectorum.
Echium vulgare.
Hieracium scouleri var. *cynoglossoides.*
Erigeron acris var. *drœbachiensis.*
Senecio balsamitæ var. *thomsoniensis.*

Among these *Axyris amarantoides* L. and *Crepis tectorum* L., introduced plants, appear to be additions to the flora of British Columbia.

Mr. W. A. Newcombe has also donated a representative collection made in the vicinity of Quesnel Lake and a portion of the Chilcotin country during the seasons of 1916 and 1917; amongst the rarer species and some not previously reported from these regions are the following:—

CHILCOTIN, 1916.

Stephanomeria minor.
Calochortus macrocarpus.
Solidago decumbens.
Mentzalia lævicaulis.

QUESNEL LAKE, 1917.

Epipactis repens var. *ophioides.*
Habenaria orbiculata.
Parnassia palustris.
Rubus strigosus.
Spiræa menziesii.
Dracocephalum parviflorum.
Stephanomeria minor.
Alnus tenuifolia.
Mitella nuda.
Ribes glandulosum.
Ribes oxyacanthoides.
Vaccinium canadense.
Hieracium umbellatum.
Senecio eremophilus.

In this as in Mr. Anderson's collection there are a number of doubtful specimens, which have been forwarded to Mr. J. M. Macoun, Chief of the Division of Biology, Geological Survey, Ottawa, and Professor J. K. Henry, of the University of British Columbia, for comparison with authenticated specimens and identification, and until such time as this work has been completed no adequate list can be chronicled.

Specimens of two additions to the flora of Vancouver Island, *Arnica cordifolia* and *Romanzoffia unalaschensis*, collected by Dr. C. F. Newcombe, of Victoria, have been donated by him to the collection in the Herbarium.

On June 16th, 17th, and 18th, Mr. F. Kermode, Director, accompanied by Dr. F. C. Newcombe, of Victoria, made a small collection of the more uncommon plants growing around Bella Coola; the following, which are usually plants growing at much higher altitude, were collected on the river-bottom, a little above sea-level:—

Epilobium latifolium.
Mimulus lewisii.
Pentstemon diffusus.

In the matter of distribution the following interesting species were collected in close proximity to salt water:—

Trautvetteria grandis.
Ranunculus orthorynchus var. *platyphyllus.*
Hemieva ranunculifolia.
Corydalis sempervirens.
Aralia nudicaulis.
Senecio balsamitæ var. *thomsoniensis.*

The Director and his assistant made a small collection on August 1st and 2nd of the more interesting plants of Mount Arrowsmith, undoubtedly one of the richest floral fields of Vancouver Island. The following specimens were collected, which appear to be additions to the flora of Vancouver Island not hitherto recorded:—

Oxyria digyna.
Lewisia pygmæa.
Saxifraga lyallii.
Antennaria rosea.
Draba nivalis.
Silene acaulis.
Osmorrhiza purpurea.
Agoseris glauca.

Other species of interest were:—

Lewisia columbiana.
Erysimum elatum.
Saxifraga punctata.
Potentilla dissecta var. *glaucophylla.*
Lomatium martindalei var. *augustatum.*
Cladothamnus pyrolæflorus.
Mimulus alpinus.
Pedicularis ornithoryncha.
Arnica amplexicaulis.
Ranunculus eschscholtzii.
Saxifraga bronchialis.
Saxifraga tolmici.
Potentilla villosa.
Epilobium anagallidifolium.
Dodecatheon pauciflorum.
Phyllodoce glanduliflorus.
Arnica latifolia.
Senecio triangularis.

A few plants were also collected in the vicinity of Long Beach, on the west coast of Vancouver Island, the latter part of September, including:—

Polypodium scouleri.
Carex macrocephala.
Listera caurina.
Gentiana douglasiana.
Stachys ciliata var. *pubens.*
Botrychium silaifolium.
Hydastylus brachypus.
Empetrum nigrum.
Franseria bipinnatifida.

A large number of specimens have been mounted by Miss H. J. Hendry, now in charge of the office of the Museum, and placed in the collection of the Herbarium; a card-index has been completed of the mounted specimens, and the whole have been arranged in their systematic order of families, according to the check-list of the plants of Gray's Manual.

A record has also been made of all duplicates and unmounted material, and the same placed in genus-covers and arranged in the same systematic order.

The nucleus of the Herbarium, the original collection loaned by the Department of Agriculture, and made by Mr. J. R. Anderson at the time he was Deputy Minister of Agriculture, has been rearranged and placed in the accepted order; this collection still remains in its original genus-covers and is in an excellent state of preservation, due to the great care Mr. Anderson took in preparing his specimens, many of which were collected twenty years ago.

From an educational standpoint the collection now in the Herbarium is available to teachers and other students of botany, and should prove a great facility to them for comparison in identifying any plants they do not know. A number of the latest and most authentic books on our flora are also at hand for reference; these will be found in the office of the Museum.

LIST OF VANCOUVER ISLAND PLANTS COLLECTED AND PRESENTED TO THE PROVINCIAL MUSEUM.

By Professor John Macoun, of Sidney, B.C.

Polypodiaceæ.

Adiantum pedatum L.
Aspidium spinulosum (O. F. Müller) Sw., var. *dilatatum* (Hoffm.) Hook.
Asplenium felix-fœmina (L.) Bernh.
Cystopteris fragilis (L.) Bernh.
Cryptogramma acrostichoides R. Br.
Lomaria spicant Desv.
Polypodium occidentale (Hook.) Maxon.
Polystichum braunii (Spenner) Fée, var. *andersoni.*
Polystichum munitum (Kaulf.) Presl.
Pteris aquilina lanuginosa Bong.
Woodwardia radicans (Smith), var. *americana* Hook.

Ophioglossaceæ.

Botrychium simplex Hitchc.
Botrychium silaifolium Presl.
Botrychium virginianum (L.) Sw.

EQUISETACEÆ.

Equisetum arvense L.
Equisetum sylvaticum L.
Equisetum telmateia Ehrh.

LYCOPODIACEÆ.

Lycopodium clavatum L.
Lycopodium lucidulum Michx.

SELAGINELLACEÆ.

Selaginella wallacei Hieron.

ISOETACEÆ.

Isoetes echinospora Durieu.

TAXACEÆ.

Taxus brevifolia Nutt.

PINACEÆ.

Abies grandis Lindl.
Chamæcyparis nootkatensis (Lamb.) Spach.
Juniperus scopulorum Sarg.
Picea sitchensis Carr.
Pinus contorta Dougl.
Pinus monticola Dougl.
Pseudotsuga taxifolia Britt.
Thuja plicata Donn.
Tsuga heterophylla (Raf.) Sarg.

TYPHACEÆ.

Typha latifolia L.

SPARGANIACEÆ.

Sparganium americanum Nutt., var. *androcladum* Engelm.
Sparganium simplex Huds.

GRAMINACEÆ.

Agropyron pseudorepens var. *magnum* Scribn. & Smith.
Agrostis alba L.
Agrostis alba L., var. *stolonifera.*
Agrostis exarata Trin.
Agrostis hyemalis (Walt.) Tuckerm.
Agrostis microphylla Steud.
Agrostis vulgaris (With.) Thurb.
Aira caryophyllea L.
Aira precox L.
Alopecurus californicus Vasey.
Alopecurus geniculatus L., var. *fulvus* (Smith) Sonder.
Alopecurus pratensis L.
Anthoxanthum odoratum L.
Arrhenatherum avenaceum Boiss.
Avena fatua L., var. *glabrata* Peter.
Bromus carinatus hookerianus (Thurb.) Shear.
Bromus commutatus Schrad.
Bromus glabrescens (Coss.) Shear.
Bromus hordeaceus L.
Bromus marginatus Nees.
Bromus maximus Desf.
Bromus pacificus Shear.
Bromus secalinus L.
Bromus sitchensis Bong.
Bromus sterilis L.
Bromus tectorum L.
Bromus vulgaris Shear.
Cinna latifolia (Trev.) Griseb.
Cynosurus cristatus L.
Cynosurus echinatus L.
Dactylis glomerata L.
Danthonia americana Scribn.
Danthonia spicata (L.) Beauv.
Deschampsia cæspitosa (L.) Beauv.
Deschampsia calycina Presl.
Deschampsia elongata (Hook.) Munro.
Elymus arenarius L.
Elymus borealis Scribn.
Elymus glaucus Buckl.
Elymus glaucus Buckl., var. *hirsutus* Malte.
Elymus vancouverensis Vasey.
Festuca bromoides L.
Festuca elatior L.
Festuca megalura Nutt.
Festuca occidentalis Hook.
Festuca pacifica Piper.
Festuca rubra L.
Festuca subuliflora Scribn.
Festuca subulata Trin.
Glyceria borealis (Nash) Batchelder.
Glyceria nervata Trin.
Glyceria nervata Trin., var. *elata* (Nash) Piper.
Glyceria pauciflora Presl.
Glyceria scabra Malte., *sp. nov.*
Holcus lanatus L.
Hordeum nodosum L.
Hordeum murinum L.
Kœleria cristata (L.) Pers.
Lolium multiflorum Lam.
Lolium perenne L.

Phalaris arundinacea L.
Phalaris canariensis L.
Phleum pratense L.
Phragmites communis Trin.
Poa annua L.
Poa compressa L.
Poa confinis Vasey.
Poa howellii Vasey.
Poa pratensis L.
Poa sandbergii Vasey.
Poa triflora Gilib.
Poa trivialis L.
Polypogon monspeliensis (L.) Desf.
Polypogon littoralis (With.) Smith.
Puccinellia lemmoni Vasey.
Puccinellia distans (L.) Parl.
Stipa minor (Vasey) Scribn.
Stipa nov. sp. Malte.

Cyperaceæ.

Carex arcta Boott.
Carex athrostachya Olney.
Carex aurea Nutt.
Carex bolanderi Olney.
Carex canescens L.
Carex cryptocarpa C. A. Mey.
Carex deweyana Schwein.
Carex diandra Schrank, var. *ampla* Bailey.
Carex dives Holm.
Carex festiva Dew.
Carex festiva pachystachya (Cham.) Bailey.
Carex furva (Bailey).
Carex hendersoni Bailey.
Carex howellii Bailey.
Carex læviculmis Meinsch.
Carex leptalea Wahl.
Carex mirata Dew.
Carex œderi Retz.
Carex pennsylvanica Lam., var. *vespertina* Bailey.
Carex phæocephala Piper.
Carex pratensis Drejer.
Carex rossii Boott.
Carex stellulata Good, var. *cephalantha* Bailey.
Carex stipata Muhl.
Carex teretiuscula ramosa Boott.
Carex utriculatâ Boott.
Carex vulgaris lipocarpha Holm.
Dulichium arundinaceum (L.) Britt.
Eleocharis palustris (L.) R. & S.
Scirpus americanus Pers.
Scirpus microcarpus Presl.
Scirpus occidentalis (Wats.) Chase.
Scirpus riparius (R. Br.) Spreng.
Scirpus robustus Pursh.
Scirpus validus Vahl.

Araceæ.

Lysichiton camtschatcensis (L.) Schott.

Lemnaceæ.

Lemna trisulca L.
Spirodela polyrhiza (L.) Schleid.

Juncaceæ.

Juncus balticus Willd.
Juncus bufonius L.
Juncus columbianus Coville.
Juncus effusus L., var. *brunneus* Engelm.
Juncus effusus gracilis Hook.
Juncus effusus L., var. *pacificus* F. & W.
Juncus ensifolius Wiks.
Juncus falcatus E. Meyer.
Juncus falcatus var. *alaskensis* Coville.
Juncus gerardi Loisel.
Juncus lescurii Boland.
Juncus occidentalis (Coville) Wiegand.
Juncus tenuis Willd.
Luzula campestris (L.) DC.
Luzula campestris (L.) DC., var. *subsessilis* Wats.
Luzula comosa E. Meyer.
Luzula comosa E. Meyer, var. *macrantha* Wats.
Luzula parviflora (Ehrh.) Desv.
Luzula spicata (L.) DC.

Liliaceæ.

Allium acuminatum Hook.
Allium cernuum Roth.
Allium geyeri Wats.
Camassia leichtlinii (Baker) Coville.
Camassia quamash (Pursh) Coville.
Disporum oreganum (Wats.) B. & H.
Erythronium giganteum Lindl.
Fritillaria lanceolata Pursh.
Hookera hyacinthina (Lindl.) Kuntz.
Lilium parviflorum (Hook.) Holzinger.
Maianthemum bifolium dilitatum Wood.
Smilacina amplexicaulis Nutt.
Smilacina sessilifolia Nutt.
Stenanthium occidentale Gray.

Streptopus amplexifolius (L.) DC.
Tofieldia intermedia Rydb.
Trillium ovatum Pursh.
Veratrum viride Ait.
Zygadenus venenosus Wats.

IRIDACEÆ.

Hydastylus borealis Bicknell.
Olsynium grandiflorum (Dougl.) Raf.
Sisyrinchium birameum Piper.
Sisyrinchium idahoënse Bicknell.
Sisyrinchium macounii Bicknell.

ORCHIDACEÆ.

Calypso bulbosa (L.) Oakes.
Corallorrhiza maculata Raf.
Corallorrhiza mertensiana Bong.
Corallorrhiza stricta Lindl.
Habenaria dilitata Hook.
Habenaria elegans Boland.
Habenaria gracilis Wats.
Habenaria leucostachys (Lindl.) Wats.
Habenaria unalaschensis (Spreng.) Wats.
Listera caurina Piper.
Listera convallarioides (Sw.) Torr.
Peramium decipiens (Hook.) Ames.
Spiranthes romanzoffiana Cham.

SALICACEÆ.

Populus tremuloides Michx.
Populus trichocarpa T. & G.
Populus vancouveriana Trelease.
Salix geyeriana Anderss.
Salix geyeriana Anderss, X *sitchensis*.
Salix hookeriana Barratt.
Salix lasiandra Benth.
Salix sitchensis Sanson.
Salix scoulcriana Barratt.

MYRICACEÆ.

Myrica gale L.

BETULACEÆ.

Betula occidentalis Hook.
Alnus oregona Nut.

FAGACEÆ.

Quercus garryana Dougl.

URTICACEÆ.

Ulmus campestris L.
Urtica lyallii Wats.

ARISTOLOCHIACEÆ.

Asarum caudatum Lindl.

POLYGONACEÆ.

Polygonum amphibium L.
Polygonum aviculare L.
Polygonum aviculare L., var. *vegetum* Ledeb.
Polygonum convolvulus L.
Polygonum erectum L.
Polygonum fowleri Robinson.
Polygonum hydropiperoides Michx.
Polygonum lapathifolium L.
Polygonum minimum Wats.
Polygonum paronychia Cham. & Schlecht.
Polygonum persicaria L.
Polygonum spergulariæforme Meisn.
Rumex acetosella L.
Rumex conglomeratus Murr.
Rumex crispus L.
Rumex obtusifolius L.
Rumex obtusifolius L., var. *discolor*.
Rumex occidentalis Wats.
Rumex persicarioides L.
Rumex pulcher L.

CHENOPODIACEÆ.

Atriplex patula L.
Atriplex patula L. var. *hastata* (L.) Gray.
Chenopodium album L.
Chenopodium humile Hook.
Chenopodium leptophyllum (Moq.) Nutt.
Salicornia ambigua Michx.
Suæda maritima (L.) Dumort.

AMARANTHACEÆ.

Amaranthus retroflexus L.

NYCTAGINACEÆ.

Abronia latifolia Esch.

Caryophyllaceæ.

Arenaria macrophylla Hook.
Arenaria serpyllifolia L.
Cerastium campestre Greene.
Cerastium viscosum L.
Dianthus armeria L.
Lychnis vespertina L.
Sagina crassicaulis Wats.
Sagina occidentalis Wats.
Saponaria officinalis L.
Silene anglica L.
Silene antirrhina L.
Silene gallica L.
Silene menziesii Hook.
Silene noctiflora L.
Silene scouleri Hook
Spergula arvensis L.
Spergula sativa Boenn.
Spergularia marina (L.) Griseb.
Spergularia rubra radicans Presl.
Stellaria borealis Bigel., var. *alpestris* (Fries) Britt.
Stellaria brachypetala Bong.
Stellaria crispa Cham. & Schlecht.
Stellaria longipes Goldie.
Stellaria media (L.) Cyrill.
Stellaria nitens Nutt.

Portulacaceæ.

Calandrinia caulescens menziesii Hook.
Claytonia dichotoma Nutt.
Claytonia howellii (Wats.) Piper.
Claytonia linearis Dougl.
Claytonia parviflora Dougl.
Claytonia parviflora Dougl., var. *depressa* Gray.
Claytonia parvifolia Moc.
Claytonia perfoliata Donn.
Claytonia sibirica L.
Claytonia spathulata Dougl.

Nymphæaceæ.

Brasenia schreberi Gmel.
Nymphæa polysepala (Engelm.) Greene.

Ranunculaceæ.

Anemone lyallii Britt.
Anemone hudsoniana (DC.) Richards.
Anemone oregana Gray.
Anemone multifida Poir.
Aquilegia formosa Fisch.
Delphinium ajacis L.
Delphinium menziesii DC.
Myosurus apetalus lepturus Gray.
Ranunculus acris L.
Ranunculus aquatilis L.
Ranunculus aquatilis pantothrix (Brot.) Piper.
Ranunculus aquatilis L., var. *trichophyllus* Gray.
Ranunculus bongardi Greene.
Ranunculus bongardi Greene, var. *douglasii* Howell.
Ranunculus cymbalaria Pursh, var. *saximontana* Fernald.
Ranunculus flammula reptans (L.) Schlecht.
Ranunculus flammula (L.), var. *unalaschensis* (Bess.) Ledeb.
Ranunculus flammula (L.), var. *intermedius* Hook.
Ranunculus occidentalis Nutt.
Ranunculus orthorhynchus Hook.
Ranunculus othorhynchus Hook., var. *platyphyllus* Gray.
Ranunculus repens L.
Thalictrum occidentale Gray.

Berberidaceæ.

Achlys triphylla (Smith) DC.
Berberis aquifolium Pursh.
Berberis nervosa Pursh.

Papaveraceæ.

Eschscholzia californica Cham.
Papaver dubium L.
Papaver somniferum L.

Fumariaceæ.

Dicentra formosa DC.

Cruciferæ.

Alyssum alyssoides (L.) Gouan.
Arabis hirsuta (L.) Scop.
Arabis glabra (L.) Bernh.
Arabis perfoliata Lam.
Brassica campestris L.
Cakile edentula (Bigel.) Hook.

Camelina sativa (L.) Crantz.
Capsella bursa-pastoris (L.) Medic.
Cardamine oligosperma Nutt.
Cardamine pennsylvanica Muhl.
Coronopus didymus (L.) Smith.
Dentaria tenella Pursh.
Draba verna L.
Erysimum occidentale (S. Wats.).
Hesperis matronalis L.
Lepidium menziesii DC.
Lepidium sativum L.
Lepidium strictum Rattan.
Neslia paniculata (L.)
Nasturtium palustre DC., var.
Radicula curvisiliqua (Hook.) Greene.
Radicula obtusa (Nutt.) Greene.
Radicula pacifica (Howell) Greene.
Raphanus sativus L.
Sisymbrium altissimum L.
Sisymbrium officinale L.
Sisymbrium officinale (L.), var. *leiocarpum* DC.

CRASSULACEÆ.

Sedum spathulifolium Hook.

SAXIFRAGACEÆ.

Heuchera cylindrica Dougl.
Heuchera micrantha Dougl.
Leptaxis menziesii (Pursh.) Raf.
Mitella pentandra Hook.
Ribes bracteosum Dougl.
Ribes divaricatum Dougl.
Ribes lacustre (Pers.) Poir.
Ribes lobbii Gray.
Ribes nigrum L.
Ribes sanguineum Pursh.
Saxifraga bongardi Presl.
Saxifraga integrifolia Hook.
Saxifraga rufidula (Small) Piper.
Tellima bulbifera Rydb.
Tellima grandiflora (Pursh) Dougl.
Tellima parviflora Hook.
Tiarella laciniata Hook.
Tiarella trifoliata L.

ROSACEÆ.

Alchemilla occidentalis Nutt.
Amelanchier florida Lindl.
Cotoneaster pyracantha (L.) Spach.
Crataegus brevispina (Dougl.) Heller.
Crataegus oxycanthoides L.
Drymocallis wrangeliana (Fisch. & Lall.) Rydb.
Fragaria bracteata Heller.
Fragaria crinita Rydb.
Fragaria cuneifolia Nutt.
Fragaria helleri Holzinger.
Geum macrophyllum Willd.
Geum oregonense Scheutz.
Osmaronia cerasiformis (T. & G.) Greene.
Physocarpus opulifolius (L.) Maxim.
Potentilla anserina L.
Potentilla dichora Rydb.
Potentilla gracilis Dougl.
Potentilla monspeliensis L.
Potentilla palustris (L.) Scop.
Potentilla recta L.
Prunus demissa (Nutt.) Dietr.
Prunus emarginata (Dougl.) Walp.
Prunus emarginata villosa Sudw.
Pyrus diversifolia Bong.
Rosa gymnocarpa Nutt.
Rosa nutkana Presl.
Rosa pisocarpa Gray.
Rosa rubiginosa L.
Rubus chamæmorus L.
Rubus laciniatus Willd.
Rubus leucodermis Dougl.
Rubus macropetalus Dougl.
Rubus parviflorus Nutt.
Rubus spectabilis Pursh.
Sanguisorba occidentale Nutt.
Spiræa discolor Pursh.
Spiræa douglasii Hook.
Spiræa menziesii Hook.

LEGUMINOSÆ.

Cytisus scoparius (L.) Link.
Hosackia bicolor Dougl.
Hosackia denticulata Drew.
Hosackia parviflora Benth.
Lathyrus latifolius L.
Lathyrus maritimus (L.) Bigel.
Lathyrus nuttallii Wats.
Lathyrus pauciflorus Fernald.
Lupinus bicolor Lindl.
Lupinus lepidus Dougl.
Lupinus littoralis Dougl.
Lupinus micranthus Dougl.
Lupinus microcarpus Sims.
Lupinus nootkatensis Donn.
Lupinus polyphyllus Lindl.
Medicago apiculata Willd.
Medicago hispida Gaertn.
Medicago lupubina L.
Medicago sativa L.
Melilotus alba Desr.

Melilotus indica (L.) All.
Melilotus officinalis (L.) Lam.
Psoralea physodes Dougl.
Robinia pseudo-acacia Dougl.
Trifolium albopurpureum T. & G.
Trifolium cyathiferum Lindl.
Trifolium dubium Sibth.
Trifolium fimbriatum Lindl.
Trifolium hybridum L.
Trifolium incarnatum L.
Trifolium microcephalum Pursh.
Trifolium microdon Hook & Arn.
Trifolium oliganthum Steud.
Trifolium pratense L.
Trifolium procumbens L.
Trifolium repens L.
Trifolium tridentatum Lindl.
Trifolium variegatum Nutt.
Ulex europæus L.
Vicia americana Muhl.
Vicia americana truncata (Nutt.) Brewer.
Vicia angustifolia (L.) Reich.
Vicia gigantea Hook.
Vicia hirsuta (L.) S. F. Gray.
Vicia sativa L.
Vicia tetrasperma (L.) Moench.

Geraniaceæ.

Geranium bicknellii Britt.
Geranium carolinianum L.
Geranium dissectum L.
Geranium molle L.
Geranium pusillum Burm.
Erodium cicutarium (L.) L'Her.
Erodium moschatum (L.) L'Her.
Euphorbia peplus L.
Euphorbia serphyllifolia Pers.

Aceraceæ.

Acer douglasii Hook.
Acer macrophyllum Pursh.

Rhamnaceæ.

Ceanothus sanguineus Pursh.
Ceanothus velutinus Dougl.
Rhamnus purshiana DC.

Malvaceæ.

Malva moschata L.
Malva parviflora L.
Malva rotundifolia L.
Malva sylvestris L.
Sidalcea hendersonii Wats.

Violaceæ.

Viola adunca Smith.
Viola glabella Nutt.
Viola howellii Gray.
Viola macloskeyi Lloyd.
Viola nuttallii præmorsa (Dougal.) Wats.
Viola palustris L.
Viola retroscabra Greene.
Viola sarmentosa Dougl. Macoun.
Viola sempervirens Greene.
Viola tricolor L.

Elæagnaceæ.

Shepherdia canadensis (L.) Nutt.

Onagraceæ.

Boisduvalia densiflora (Lindl.) Wats.
Circæa pacifica Asch & Magn.
Epilobium adenocaulon Haussk.
Epilobium anagallidifolium Lam.
Epilobium angustifolium L.
Epilobium minutum Lindl.
Epilobium paniculatum Nutt.

Araliaceæ.

Fatsia horrida (Smith) B. & H.

Umbelliferæ.

Angelica genuflexa Nutt.
Anthriscus sativa L.
Carum gairdneri (Hook. & Arn.) Gray.
Caucalis microcarpa Hook.
Cicuta douglasii (DC.) C. & R.
Cicuta purpurea Greene.
Cicuta vagans Greene.
Conioselinum gmelini (Cham. & Schlecht.) C. & R.
Conium maculatum L.
Daucus carota L.
Daucus pusillus Michx.
Heracleum lanatum Michx.
Hydrocotyle ranunculoides L.f.
Leptotænia dissecta Nutt.
Lomatium lævigatum (Nutt.) C. & R.
Lomatium nudicaule (Pursh) C. & R.
Lomatium utriculatum (Nutt.) C. & R.

Œnanthe sarmentosa Presl.
Osmorhiza divaricata Nutt.
Osmorhiza leibergii (C. & R.) Suksdorf.
Pastinaca sativa L.
Sanicula arctopoides H. & A.
Sanicula bipinnatifida Dougl.
Sanicula howellii C. & R.
Sanicula menziesii Hook. & Arn.

CORNACEÆ.

Cornus canadensis L.
Cornus nuttallii Audubon.
Cornus occidentalis (T. & G.) Coville.

ERICACEÆ.

Allotropa virgata T. & G.
Arbutus menziesii Pursh.
Arctostaphylos tomentosa (Pursh) Dougl.
Arctostaphylos uva-ursi (L.) Spreng.
Chimaphila ubellata (L.) Nutt.
Gaultheria ovatifolia Gray.
Hypopitys hypopitys (L.) Small.
Kalmia glauca Ait.
Pterospora andromedea Nutt.
Pyrola aphylla Smith.
Pyrola bracteata Hook.
Pyrola elata Nutt.
Pyrola picta Smith.
Pyrola picta dentata Smith.
Pyrola picta integra Gray.
Vaccinium cæspitosum Michx.
Vaccinium cuneifolium Nutt.
Vaccinium oxycoccus intermedius (Gray) Piper.

PLUMBAGINACEÆ.

Statice armeria L.

PRIMULACEÆ.

Anagallis arvensis L.
Centunculus minimus L.
Dodecatheon latifolium (Hook.) Piper.
Dodecatheon vulgare (Hook.) Piper.
Glaux maritima L.
Lysimachia thyrsiflora L.
Trientalis arctica Fisch.
Trientalis latifolia Hook.

GENTIANACEÆ.

Centaurium centaurium (L.) W. F. Wight.
Gentiana acuta Michx.
Gentiana sceptrum Griseb.
Menyanthes trifoliata L.

APOCYNACEÆ.

Apocynum androsæmifolium L.

CONVOLVULACEÆ.

Convolvulus arvensis L.
Convolvulus sepium L.
Cuscuta squamigera Engelm.
Cuscuta arvensis Beyrich.
Cuscuta epithymum Murr.

POLEMONIACEÆ.

Collomia heterophylla Hook.
Collomia grandiflora Dougl.
Gilia achilleæfolia Benth.
Gilia bicolor (Nutt.) Piper.
Gilia gracilis (Dougl.) Hook.
Gilia squarrosa H. & A.

HYDROPHYLLACEÆ.

Nemophila parviflora Dougl.
Nemophila sepulta Parish.
Phacelia linearis (Pursh) Holzinger.
Romanzoffia sitchensis Bong.

BORAGINACEÆ.

Allocarya plebeia Greene.
Amsinckia intermedia Fisch & Meyer.
Amsinckia lycopsoides Lehm.
Myosotis arvensis (L.) Hill.
Myosotis laxa Lehm.
Myosotis versicolor (Pers.) J. E. Smith.
Plagiobothrys tenellus (Nutt.) Gray.

VERBENACEÆ.

Verbena hastata L.

LABIATÆ.

Lamium amplexicaule L.
Lycopus Americanus Muhl.
Lycopus uniflorus Michx.
Marrubium vulgare L.
Mentha arvensis L., var. *canadensis* (L.) Briquet.
Mentha spicata viridis L.
Micromeria chamissonis (Benth.) Greene.
Nepeta hederacea (L.) Trevisan.
Prunella vulgaris L.
Scutellaria galericulata L.
Stachys ciliata Dougl.

SOLANACEÆ.

Solanum nigrum var. *villosum* L.

SCROPHULARIACEÆ.

Castilleja angustifolia bradburii (Nutt.) Fernald.
Castilleja levisecta Greenman.
Collinsia grandiflora pusilla Gray.
Collinsia tenella (Pursh) Piper.
Limosella tenuifolia Wolf.
Linaria vulgaris Hill.
Mimulus alsinoides Dougl.
Mimulus grandiflorus Howell.
Mimulus langsdorfii Donn.
Mimulus moschatus Dougl.
Mimulus nasutus Greene.
Orthocarpus attenuatus Gray.
Orthocarpus bracteosus Benth.
Orthocarpus hispidus Benth.
Orthocarpus pusillus Benth.
Rhinanthus crista-galli L.
Veronica arvensis L.
Veronica americana Schwein.
Veronica peregrina L.
Veronica serpyllifolia L.
Veronica scutellata L.
Veronica tournefortii C.C. Gmel.

LENTIBULARIACEÆ.

Utricularia vulgaris L., var. *americana* Gray.

OROBANCHACEÆ.

Orobanche uniflora L.
Orobanche comosa Hook.
Orobanche pinetorum Gray.

PLANTAGINACEÆ.

Plantago bigelovii Gray.
Plantago lanceolata L.
Plantago macrocarpa Cham. & Schlecht.
Plantago major L.
Plantago major L., var. *asiatica* (L.) Dene.

RUBIACEÆ.

Galium aparine L.
Galium aparine L., var. *vaillantii* (DC.) Koch.
Galium boreale L.
Galium trifidum pacificum Wiegand.
Galium triflorum Michx.
Sherardia arvensis L.

CAPRIFOLIACEÆ.

Linnæa americana Forbes.
Lonicera ciliosa (Pursh) Poir.
Lonicera hispidula Dougl.
Lonicera involucrata Banks.
Sambucus callicarpa Greene.
Sambucus glauca Nutt.
Symphoricarpus mollis Nutt.
Symphoricarpus racemosus Michx.

VALERIANACEÆ.

Valerianella anomala Gray
Valerianella congesta Lindl.

CUCURBITACEÆ.

Echinocystis oregana T. & G.

CAMPANULACEÆ.

Campanula scouleri Hook.
Specularia perfoliata (L.) A. DC.

COMPOSITÆ.

Achillea lanulosa Nutt.
Achillea millefolium L.
Adenocaulon bicolor Hook.
Agoseris grandiflora Nutt.

Agoseris laciniata (Nutt.) Greene.
Anaphalis margaritacea (L.) B. & H.
Anaphalis margaritacea occidentalis Greene.
Anaphalis margaritacea subalpina Gray.
Antennaria concolor Piper.
Antennaria howellii Greene.
Anthemis arvensis L.
Arctium minus Bernh.
Arctium minus Bernh., var. *tomentosum* Mill.
Arnica amplexicaulis Nutt.
Arnica latifolia Bong.
Artemisia suksdorfii Piper.
Aster douglasii Lindl.
Aster foliaceus.
Balsamorhiza deltoidea.
Bellis perennis L.
Bidens amplissima Greene.
Cichorium intybus L.
Chrysanthemum leucanthemum L.
Chrysanthemum parthenium (L.) Pers.
Cirsium arvense (L.) Scop.
Cirsium edule Nutt.
Cirsium lanceolatum (L.) Scop.
Cotula coronopifolia L.
Crepis capillaris (L.) Wallr.
Crocidium multicaule Hook.
Erigeron canadensis L.
Erigeron philadelphicus L.
Eriophyllum lanatum (Pursh) Forbes.
Franseria bipinnatifida Nutt.
Gnaphalium purpureum L.
Gnaphalium palustre Nutt.
Gnaphalium microcephalum Nutt.
Grindelia integrifolia DC.
Helenium autumnale grandiflorum (Nutt.) Gray.
Hieracium albiflorum Hook.
Hypochæris glabra L.
Hypochæris radicata L.
Lactuca scariola integrata Gren. & Godr.
Lactuca spicata (Lam.) Hitchc.
Lapsana communis L.
Luina hypoleuca Benth.
Madia exigua (Smith) Greene.
Madia racemosa (Nutt.) T. & G.
Madia sativa Molina.
Matricaria matricarioides (Less.) Porter.
Petasites speciosa (Nutt.) Piper.
Preanthes alata (Hook.) Gray.
Senecio vulgaris L.
Senecio sylvaticus L.
Silybum marianum (L.) Gaertn.
Solidago elongata Nutt.
Solidago glutinosa Nutt.
Solidago lepida DC.
Sonchus asper (L.) Hill.
Sonchus oleraceus L.
Tanacetum vulgare L.
Taraxacum officinale Weber.
Tragopogon porrifolius L.

LIST OF MUSCI COLLECTED AND PRESENTED TO THE PROVINCIAL MUSEUM.

By Professor John Macoun.

Sphagnaceæ.

Sphagnum acutifolium Russ & Warnst.
Sphagnum cuspidatum Russ & Warnst.
Sphagnum fuscum Von Klinggraeff.
Sphagnum papillosum Lindb.
Sphagnum squarrosum Pers.

Andreæaceæ.

Andreæa petrophila Ehrh.

Dicranaceæ.

Dicranella heteromalla Schimp.
Dicranum congestum Brid.
Dicranum fuscescens Turn.
Dicranum howellii.
Dicranum scoparum Hedw.
Dicranum strictum Drumm.
Dicranum subpalustre C. M. & Kindb.
Dicranum sulcatum Kindb.

Ceratodonteæ.

Ceratodon purpureus Brid.
Distichium capillaceum Brunch & Schimp.

Pottieæ.

Leptotrichum flexicaule Hampe.
Barbula convoluta Hedw.
Barbula leptotricha C. M. & Kindb.
Barbula megalocarpa Kindb.
Barbula mucronifolia Bruch & Schimp.
Barbula ruralis Hedw.
Barbula subulata Beauv.
Barbula vincalis Braun.

GRIMMIEÆ.

Scoulcria muclleri Kindb.
Racomitrium canescens Brid.
Racomitrium eriocoides Bruch & Schimp.
Racomitrium heterostichum Brid.
Racomitrium varium.
Hedwigia ciliata Ehrh., var. *leucophæa* Schimp.
Braunia californica Lesq.
Braunia californica var. *pilifera* Lesq. & James.

ORTHOTRICHEÆ.

Amphoridium californicum Lesq. & James.
Ulota phyllantha Mitt.
Orthotrichum lyellii Hook & Tayl.
Orthotrichum puchellum Brunton.
Encalypta streptocarpa Hedw.

PHYSCOMITRIEÆ.

Funaria hygrometrica Sibth., var. *calvescens* Bruch & Schimp.

BARTRAMIEÆ.

Bartramia pomiformis Hedw.
Philonotis macounii Lesq. & James.
Philonotis fontana Brid.
Philonotis marchica Brid.

BRYEÆ.

Leptobryum pyriforme Schimp.
Webera albicans Schimp.
Webera nutans Hedw.
Bryum capillare Linn.
Bryum cirrhatum Hoppe. & Hornsch.
Mnium affins Bland.
Mnium glabrescens.
Mnium inclinatum Lindb.
Mnium insigne Mitt.
Mnium menziesii C. Muell.
Mnium spinulosum Bruch. & Schimp.
Mnium venustrum Mitt.

AULACOMNIUM.

Aulacomnium androgynum Schwaegr.
Aulacomnium palustre Schwaegr.

TIMMIEÆ.

Timmia austriaca Hewd.

GEORGIACEÆ.

Georgia genuflexa.

POLYTRICHEÆ.

Atrichum undulatum Beauv.
Catharineæ undulata (L.) Web. & Mohr.
Pogonatum alpinum Roehl.
Pogonatum alpinum var. *septentrionale* Brid.
Polytrichum commune Lindb.
Polytrichum juniperinum Willd.
Polytrichum piliferum Schreb.
Polytrichum strictum Banks.

FONTINALCÆ.

Fontinalis antipyretica Linn.
Fontinalis chrysaphylla Card.
Fontinalis kinbergii Can. Musc.
Fontinalis patens.
Dichelyma cylindricarpum Aust.

NECKEREÆ.

Alsia abictina Sulliv.
Neckera douglasii Hook.
Neckera douglasii Hook., var. *macounii* Kindb.
Neckera menziesii Drumm.
Homalia macounii C. M. & Kindb.

LEUCODONTEÆ.

Antitrichia californica Sulliv.

HYPNEÆ.

Heterocladium heteroptoides Best.
Heterocladium heteroptoides var. *filicens* Best.
Thuidium crispifolium (Hook.) Kindb.
Camptothecium nuttallii Kindb.
Camptothecium lutescens Bruch. & Schimp.
Brachythecium albicans Bruch. & Schimp.
Brachythecium asperrimum Mitt.

Brachythecium rivulare Bruch. & Schimp.
Brachythecium rutabulum Bruch. & Schimp.
Brachythecium salebrosum Bruch. & Schimp.
Scleropodium cæspitosum Bruch. & Schimp.
Scleropodium calpophyllum.
Scleropodium obtusifolium Kindb.
Isothecium cardoti Kindb.
Isothecium brewerianum Lesq. & James.
Isothecium lentum Lesq. & James.
Isothecium myurellum Kindb.
Isothecium nuttallii.
Isothecium stoloniferum Brid.
Eurynchium stokesii Bruch. & Schimp.
Eurynchium semiasperum C. M. & Kindb.
Raphidostegium roellii Ren. & Card.
Thamnium liebergii.
Plagiothecium denticulatum Bruch. & Schimp.
Plagiothecium erichapherum.
Plagiothecium sylvaticum Bruch. & Schimp.
Plagiothecium undulatum Bruch. & Schimp.
Amblystegium serpens Bruch. & Schimp.
Amblystegium riparium Bruch. & Schimp.
Hypnum circinale Hook.
Hypnum curvifolium Hedw.
Hypnum cohearens.
Hypnum filicinum Linn.
Hypnum kneiffii Bruch. & Schimp.
Hypnum kneiffii var. *gracilescens* Bruch. & Schimp.
Hypnum palustre Huds.
Hypnum robustum Hook.
Hypnum subimponens Lesq.
Hypnum vernicosum Lindb.
Hylocomium splendens (Hedw.) Schimp.

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Annual Report of U.S. Nat. Museum, 1916-17.

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Vol. 16, No. 24—Ascidians of the Littoral Zone of Southern California. William E. Ritter and Ruth A. Forsyth.

Vol. 18, No. 1—Mitosis in Giardia microti. William C. Boeck.

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Notes on the Ten Thousand Islands, Florida. Moore.
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Some Aboriginal Sites on Green River, Kentucky.
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VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

SEVENTH ANNUAL REPORT

OF THE

SUPERINTENDENT OF INSURANCE

FOR THE

PROVINCE OF BRITISH COLUMBIA

1918

(BUSINESS TRANSACTED IN 1917)

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

May it please your Honour:

The undersigned has the honour to present the Seventh Annual Report of the Superintendent of Insurance for the year ended December 31st, 1917.

JOHN HART,

Minister of Finance.

Victoria, B.C., July 8th, 1918.

REPORT OF THE SUPERINTENDENT OF INSURANCE.

DEPARTMENT OF INSURANCE,
VICTORIA, B.C., July 8th, 1918.

The Honourable John Hart,
Minister of Finance, Victoria, B.C.

SIR,—Pursuant to the "British Columbia Fire Insurance Act" and the "Insurance Act," I have the honour to submit herewith a report for the year ended December 31st, 1917.

I. "BRITISH COLUMBIA FIRE INSURANCE ACT."

(1.) FIRE INSURANCE COMPANIES.

At the close of 1917, 109 companies were licensed to carry on the business of fire insurance in the Province, being a decrease of five companies from the previous year. Their origin is shown by the following table:—

Where incorporated.	Dominion Licensees.	Provincial Licensees.	Totals.
Dominion of Canada	19	..	..
Provinces of Canada	5	..	5
Great Britain	29	2	31
United States of America	34	14	48
Hong Kong	1	..	1
France	4	..	4
Sweden	..	1	1
Totals	92	17	109

The Globe Indemnity Company of Canada and the Union Insurance Society of Canton, Limited, both Dominion licensees, were new companies admitted during 1917. A licence was also issued by my predecessor to the Guardian Fire Insurance Company of Utah, but a judgment of the Appeal Court of the Province has perpetually enjoined it from carrying on business here owing to the similarity of its name to that of the Guardian Assurance Company, Limited.

Seven Provincial licensees were in 1917 granted a Dominion licence, namely:—

Agricultural Insurance Company.
Alliance Insurance Company of Philadelphia.
British Crown Assurance Corporation, Limited.
Century Insurance Company, Limited.
Citizens Insurance Company of Missouri.
Commercial Union Fire Insurance Company of New York.
Merchants Fire Assurance Corporation of New York.

Eight companies, I regret to say, decided to cease business and withdraw from the Province. The reason for this action may in every case save one be ascribed to the effect of the legislation enacted by Parliament last year and treated of more fully later in this report. These companies were:—

Arizona Fire Insurance Company.
Factories Insurance Company of Canada.
Franklin Fire Insurance Company of Philadelphia.
German Alliance Insurance Company.
Michigan Commercial Insurance Company.
New Zealand Insurance Company, Limited.
Pacific Fire Insurance Company.
Pacific States Fire Insurance Company.

The list of companies licensed for fire insurance as at December 31st, 1917, appears on pages 34 and 35.

The tax on premiums for fire insurance has been promptly paid by licensed companies, and some outstanding taxes have been collected. Arrears of taxes are still due from a few companies which have passed into liquidation or the hands of receivers. There has been more difficulty in collecting the tax from persons insuring with unlicensed insurers.

Premiums received during the year in the Province amounted to $3,609,442.95, being more than the sum received in 1916 by $487,557.08, and the amount paid for losses was $958,460.60, a decrease of $332,180.90 in the figures for 1916. The statistics are set forth on pages 37 and 38, and a table showing the premiums received and losses incurred and paid since 1912 on page 38.

(2.) FIRES.

In cities and district municipalities not only did a smaller number of fires occur, but the loss sustained was lighter. Owing, however, to the inclusion in this year's report of figures for fires in other parts of the Province from which reports were not previously received the total loss is higher than in 1916, although the number of fires is still less.

According to the Dominion Blue Book, the losses in this Province were for 1917 25 per cent. only of premiums written, the lowest ratio in Canada. In 1916 the ratio was 45 per cent., a figure which gave British Columbia second place.

It is nevertheless manifest from the tables on pages 42 to 47 that a very large percentage of the fires which occurred were strictly preventable, a state of affairs not peculiar to this Province, but demanding and susceptible of remedial measures. The principal means to a reduction of fire losses of this character are the education of the public and the exercise of more care. Fire marshals over the whole of North America are now actively and zealously engaged in a campaign against this national foe. By the dissemination of literature, lectures, parades, etc., they are striving to teach citizens what is their duty as well as their interest. It is an uphill task, and it is gradually becoming clear that if a man will not take precautions to prevent fire, he should be made to incur a personal and pecuniary responsibility for his selfish carelessness. In this connection I would recall that in the United States October 9th is each year set apart as Fire-prevention Day. The practice and the day might well be followed here. The war has imparted to the huge waste by fire an international significance, because it involves destruction of material and supplies urgently needed for military purposes. The people of Canada would, I believe, enter into the spirit of the movement with as much fervour as their Allies across the border, and the gain in knowledge would be permanent.

In 122 instances the cause of the fire was reported as unknown, and these fires account for over 50 per cent. of the losses incurred in the Province. The figures are high and it is hoped that experience will reduce the proportion. Over 25 per cent. of the losses was due to fires in dwelling-houses, a ratio that could easily be improved by the exercise of more care. Several large fires occurred, involving considerable loss, namely:—

South-east Kootenay District.—Near Moyie, February 27th, 1917: Concentrator at St. Eugene Mine; loss, $105,000; cause, unknown. Natal, September 10th, 1917: Stores, hotel, dwelling, and pool-room; loss, $60,000; cause, unknown.

Vancouver.—January 4th, 1917: Warehouse, Wood, Vallance & Leggat; loss, $222,900; cause, unknown. March 8th, 1917: Garage, Hoffmeister Bros.; loss, $50,000; cause, gasolene explosion.

Victoria.—June 8th, 1917: Factory (wood-worker), Cameron Mill Company; loss, $120,794; cause, hot bearing.

Eight lives were lost by a fire which occurred at the Coquahalla Hotel at Hope.

Twenty-five fires suspected of incendiary origin occurred and six inquiries were held.

II. "INSURANCE ACT."

At the end of last year there were ninety-four companies licensed under this Act for the transaction of numerous kinds of insurance. The list will be found on pages 48 to 50, and other tables in detail on subsequent pages. I append a summary of these companies:—

Where incorporated.	Dominion Licensees.	Provincial Licensees.	Total.
British Columbia	..	2	2
Canada	31	..	31
Other Provinces of Canada	4	2	6
Great Britain	19	8	27
Australia	..	1	1
Hong Kong	1	2	3
United States of America	23	1	24
Totals	78	16	94

During 1917:—

Two new companies were granted a licence here, namely:—

Western Life Assurance Company.

Union Insurance Society of Canton, Limited.

(At the date of this report both companies were Dominion licensees.)

The British Crown Assurance Corporation, Limited, was granted a Dominion licence.

Five companies applied for supplementary licences under this Act. These companies were:—

Alliance Assurance Company, Limited (automobile insurance),

Canadian Surety Company (burglary and plate-glass insurance).

Ocean Accident & Guarantee Corporation, Limited (burglary and automobile insurance).

General Accident Assurance Company of Canada (steam-boiler insurance).

Railway Passengers Assurance Company (automobile insurance).

Two companies retired from business here:—

British Columbia Life Assurance Company.

Guardian Casualty & Guaranty Company of Utah.

The former found the normal difficulties of a young company increased by conditions arising out of the war. Its entire business was reinsured by the Sun Life Assurance Company of Canada.

The latter was carrying on a large business here, but is now in a state of liquidation, due, so far as my information goes, to mismanagement and inadequate reserves on its premiums.

It will be seen from the table on page 53 that the new life insurance secured displays a considerable increase over the figures for the previous year, and is an indication that the public not only realizes more fully that it is almost a duty of citizenship to carry some life insurance, but also has the means to pay for and keep up the policies taken. It is creditable to the Province that the average amount of life insurance *per capita* is higher than in any other Province.

The statistics relating to miscellaneous classes of insurance will be found on page 51.

III. GENERAL.

Last year was noteworthy in the history of insurance legislation through the passage by Parliament of the "Insurance Act, 1917," coupled with certain amendments to the Criminal Code, designed to strengthen the position taken by the Federal authorities. The decision rendered by the Privy Council in the Insurance Reference Case seriously impaired the principles on which the "Insurance Act, 1910," was constructed. The new Act is founded on the observations made in the judgment and seeks to derive its authority from the jurisdiction of the Dominion over aliens and in respect of the regulation of trade and commerce, while the exclusive power in the criminal field is utilized to confirm the provisions of the main Act. So far as I am aware, the constitutionality of the new enactments has not yet been tested in the Courts. But it is possible that objectionable features exist and that Parliament will be found to have exceeded its

powers; it may perhaps be necessary for the Provinces to take some step in order to protect themselves against Federal encroachments on their authority in this regard.

Meanwhile the new enactments must be accepted as law. The situation thus created has, however, proved detrimental to the interests of this Province at least. Some seven American companies have been practically forced to retire against their will, because they did not wish to commit an indictable offence nor to take out a Dominion licence, as they carried on business in this Province only of Canada. Their dealings with the public here were, I believe, quite satisfactory. Thus a considerable amount of competition in the insurance business has been withdrawn, and the Provincial revenue will suffer a loss. It is very regrettable that no provision was made by the "Insurance Act, 1917," allowing these companies and their clients some period in which to make other arrangements after the new law came into force.

Another meeting of the Superintendents of Insurance for the Western Provinces took place last year and the conference is gradually becoming an institution. The business of insurance is peculiarly adapted to uniformity of legislation, which is the chief aim of these meetings. The conference was held at Winnipeg on December 5th to 8th and was attended by the officials for Manitoba, Saskatchewan, Alberta, and British Columbia. The Provinces of Ontario and Quebec have now joined the movement and will be represented on the next occasion. The principal subects, on which papers were read, were: Standardization of health and accident contracts, Provincial rights and Dominion laws, Provincial laws and admitted assets, uniform automobile insurance, preferred beneficiaries, and uniformity of Department statements and the investments of Provincial companies. The work of the Superintendents was, I think, appreciated by the insurance fraternity, and with proper support cannot fail to produce benefit.

The notes above as to fires during 1917 suffice to show that effort to diminish the huge annual loss should be not only maintained, but increased. The subject of fire-prevention receives more and more attention as its magnitude is brought home to the public. It is gratifying, therefore, that the Legislature saw fit to amend the "British Columbia Fire Insurance Act" this session in this connection and that the new provisions have met with a cordial reception from the fire insurance companies doing business here.

My predecessor, E. F. Gunther, made in his last report certain recommendations as to legislation. Some of these should, I submit, be taken into consideration at an early date, especially if this Province wishes the movement towards uniform legislation to bear practical fruit. There is little doubt that the consolidation of the "Insurance Acts" and their various amendments is overdue and has become more necessary owing to the new legislation by the Dominion. The regulation, too, of the storage of gasolene and similar oils according to the latest legislation is highly desirable. Thirdly, the "Mutual Fire Insurance Companies Act" should be amended so that such companies are made subject to this Department.

I have the honour to be,

Sir,

Your obedient servant,

H. G. GARRETT,

Superintendent of Insurance.

APPENDIX.

FIRE INSURANCE.

Annual Statements of Provincial Licensees for Year ended December 31st, 1917.

The statements of the following companies, as Provincial licensees only, were printed in full in last year's report, but are now omitted either because they have obtained a Dominion licence or ceased to transact business in the Province:—

(*a.*) Obtained Dominion Licence.

Agricultural Insurance Co.	Watertown, N.Y.
Alliance Insurance Co. of Philadelphia	Philadelphia, Pa.
Boston Insurance Co.	Boston, Mass.
British Crown Assurance Corporation, Ltd.	Glasgow, Scotland.
The Century Insurance Co., Ltd.	Edinburgh, Scotland.
Citizens Insurance Co. of Missouri	St. Louis, Mo.
Commercial Union Fire Insurance Co.	New York, N.Y.
Fire Association of Philadelphia	Philadelphia, P.A.
Mechanics & Traders Insurance Co.	New Orleans, La.
Merchants Fire Assurance Corporation of New York	New York, N.Y.
Newark Fire Insurance Co.	Newark, N.J.
New Jersey Fire Insurance Co.	Newark, N.J.
Northwestern Mutual Fire Association	Seattle, Wash.
Union Marine Insurance Co., Ltd.	Liverpool, England.
Vulcan Fire Insurance Co.	Oakland, Cal.

(*b.*) Ceased to transact Business.

Guardian Fire Insurance Co.	Salt Lake City, Utah.
Detroit Fire & Marine Insurance Co.	Detroit, Mich.
The Industrial Fire Insurance Co.	Akron, Ohio.
Michigan Fire & Marine Insurance Co.	Detroit, Mich.
Pacific Fire Insurance Co.	New York, N.Y.
Pacific States Fire Insurance Co.	Portland, Ore.
Reliance Insurance Co. of Philadelphia	Philadelphia, Pa.
Svea Fire & Life Insurance Co.	Gothenburg, Sweden.

NATIONAL BENEFIT LIFE & PROPERTY ASSURANCE COMPANY, LIMITED.

Head Office—London, England.

Officers.

R. W. Granville-Smith, J.P., L.C.C., Chairman.
Joseph Francis, O.B.E., J.P., F.S.S., Managing Director.
S. F. Gandell, B.A., F.C.I.S., Secretary.

Directors.

R. W. Granville-Smith, J.P., L.C.C. — H. Gordon Jeaffreson.
H. H. Holford. — Sir Francis Lowe, Bart., M.P.

Amount deposited with the Government of British Columbia: City of Regina Consolidated Registered Stock, £2,000; City of New Westminster bonds, $15,000; Canadian Pacific Railway 6-per-cent. Note Certificates, $2,500; total $27,233.32 (par).

Authorized capital	£120,000	0	0
Amount subscribed	120,000	0	0
Amount paid	56,000	0	0

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

				£	s.	d.
Mortgages on property within the United Kingdom				574,170	15	1
Loans on the Company's policies within their surrender value				11,370	11	9
Loans on personal security				5,834	12	4
Investments, deposits with the High Court—						
Life Department—						
India 3% Stock, at cost	£ 6,370	0	0			
India 3½% Stock	5,628	15	0			
2½% Consols	8,001	5	0			
	£20,000	0	0			
Employers' Liability Department—						
5% War Loan	20,000	0	0			
				40,000	0	0
British Government securities, at cost				120,328	13	3
Treasury bills, at cost				148,209	15	10
Colonial Government securities, at cost				23,038	10	0
Colonial Provincial securities, at cost				1,099	13	3
Colonial municipal securities, at cost				12,631	3	6
Foreign Government securities, at cost				130,591	1	0
Foreign municipal securities, at cost				900	7	8
Railway and other debentures and debenture stock				14,321	10	9
Railway and other preference and guaranteed stocks				16,478	16	10
Railway ordinary stocks				3,070	0	0
Freehold ground-rents				801	8	3
Shares in public companies				15,474	3	8
House and office property (less depreciation written off)				9,968	15	3
Agents' balances, less reserve				226,143	9	10
Amounts due from other companies and brokers, less reserve				301,014	0	0
Debtors, sundry				2,199	7	5
Outstanding premiums				5,041	8	9
Deposits with other companies in respect of reinsurances				32,425	15	2
Outstanding interest, dividends, and rents				8,104	18	0
Furniture and fixtures at Head Office and branches (less depreciation written off)				2,631	14	1
Cash on deposit	£72,543	2	0			
Cash in hand and on current account	85,521	17	5			
				158,064	19	5
				£1,863,915	11	1

Liabilities.

		£ s. d.
Shareholders' capital paid up	£ 56,000 0 0	
Life Assurance Fund	28,519 4 5	
Fire and General Insurance Fund	21,487 4 8	
Marine Insurance Fund	214,755 19 3	
Employers' Liability Insurance Fund	404 10 10	
Bond Investment and Endowment Certificate Fund	641,000 0 0	
Investment Reserve Fund	22,000 0 0	
Profit and Loss Account	5,148 15 11	
		989,315 15 1
Claims admitted or intimated, but not paid—		
Life assurance	£ 1,285 9 0	
Fire insurance	18,198 13 1	
General insurance	3,194 6 4	
Marine insurance	28,658 9 1	
Bond investment	2,036 19 2	
		53,373 16 8
Deposits		278,522 8 0
Creditors' and credit balances, including amounts due to other companies		207,908 9 4
Deposits from other companies in respect of reinsurance		334,795 2 0
		£1,863,915 11 1

Marine Insurance Department (Revenue Account).

	£ s. d.
Claims paid and outstanding after deduction of reinsurances	223,844 3 9
Commission and expenses of management	109,520 4 9
Amount carried to Profit and Loss Account	41,950 2 7
Balance, subject to unexpired risks	214,755 19 3
	£590,070 10 4

		£ s. d.
Balance at the beginning of the year		43,441 6 2
Premiums, less reinsurances		544,798 6 6
Interest	£2,172 11 4	
Less income-tax thereon	341 13 8	
		1,830 17 8
		£590,070 10 4

Fire and General Insurance Departments (Revenue Account).

	£ s. d.
Claims paid and outstanding	44,647 7 9
Commission	9,739 7 0
Expenses of management, etc.	8,293 17 7
Balance, subject to unexpired risks	21,487 4 8
	£84,167 17 0

	£ s. d.
Amount of funds at the beginning of the year	5,338 11 4
Premiums, less reinsurances	63,319 0 4
Interest, less income-tax thereon	179 1 6
Amount carried to Profit and Loss Account	15,331 3 10
	£84,167 17 0

Employers' Liability Department (Revenue Account).

	£	s.	d.
Claims paid and outstanding	7	2	10
Commission	167	13	0
Expenses of management	669	4	8
Balance, subject to unexpired risks	404	10	10
	£1,248	11	4

		£	s.	d.
Premiums, less reinsurances		851	16	4
Interest on deposit with the High Court	£529 0 0			
Less income-tax thereon	132 5 0			
		396	15	0
		£1,248	11	4

Life Department (Revenue Account).

	£	s.	d.
Claims under policies paid and outstanding by death	2,846	8	3
Surrenders	360	6	0
Commission	1,537	4	10
Expenses of management	4,295	5	3
Amount of Life Assurance Fund at the end of year	28,519	4	5
	£37,558	8	9

		£	s.	d.
Amount of Life Assurance Fund at the beginning of the year		22,308	0	0
Premiums, less reassurances		14,446	4	3
Interest on deposit with the High Court	£708 18 8			
Less income-tax thereon	177 4 8			
		531	14	0
Interest (general)	£352 12 5			
Less income-tax thereon	88 3 1			
		264	9	4
Fees, etc.		8	1	2
		£37,558	8	9

Bond Investment and Endowment Certificate Department (Revenue Account).

	£	s.	d.
Claims under bonds and certificates paid and outstanding	21,086	12	10
Commission	1,919	8	10
Expenses of management	8,139	0	11
Interest on fully paid bonds, less tax	1,851	17	6
Trustees' fees	100	0	0
Loss on mortgages realized	335	10	9
Bad debts	50	13	6
Amount carried to Profit and Loss Account	1,175	3	5
Amount of Bond Investment and Endowment Certificate Fund at the end of the year	641,000	0	0
	£675,658	7	9

		£ s. d.
Amount of Bond Investment and Endowment Certificate Fund at the beginning of the year		600,000 0 0
Premiums		50,446 11 4
Interest, dividends, and rents	£30,020 9 7	
Less income-tax claimed and allowed	5,346 17 6	
		24,673 12 1
Transfer and other fees		538 4 4
		£675,658 7 9

Profit and Loss Account.

	£ s. d.
Dividends to shareholders, less tax	4,134 11 1
Interest on deposits, less tax	795 0 4
Directors' fees	900 0 0
Depreciation of furniture, etc.	291 6 0
Transferred to Investment Reserve Fund	5,000 0 0
Transferred to special reserve	7,417 19 7
Transferred to Fire and General Insurance Account	15,331 3 10
Income-tax	1,480 5 0
Office property depreciation	1,000 0 0
Establishment account, Life Department	5,893 1 9
Balance	5,148 15 11
	£47,392 3 6

		£ s. d.
Balance of last year's account		3,506 14 4
Interest and dividends not carried to other accounts	£760 3 2	
Less income-tax thereon	...	
		760 3 2
Transferred from Bond Investment Account		1,175 3 5
Transferred from Marine Insurance Account		41,950 2 7
		£47,392 3 6

RETURNS FOR BRITISH COLUMBIA.

Deposit with Government (municipal securities, etc.) (par)	$ 27,233 32
Other assets	*Nil.*
Liabilities	1,991 46
Premiums written, less return premiums	254 53
Losses incurred, net	739 95
Losses paid, net	739 95
Net amount at risk	477,200 00

RHODE ISLAND INSURANCE COMPANY.

Head Office—Providence, R.I.

Officers.

George L. Shepley, President ..... Providence, R.I.
Emil G. Pieper, Vice-President and Secretary ..... Providence, R.I.

Directors.

Frederick A. Ballou.	C. H. Hutchins.	Emil G. Pieper.
Henry A. Carpenter.	Benjamin A. Jackson.	George L. Shepley.
Samuel P. Colt.	Frank W. Matteson.	Oscar Swanson.
Louis H. Comstock.	Samuel M. Nicholson.	Wm. L. Sweet.
Michael F. Dooley.	Frederick S. Peck.	Byron S. Watson.
Darius L. Goff.	Frank N. Phillips.	Wm. M. Wood.
Lyman B. Goff.		

Amount deposited with the Government of British Columbia: Bond of the Canadian Surety Company for $25,000 in lieu of deposit.

Authorized capital	$500,000 00
Amount subscribed	500,000 00
Amount paid	500,000 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Cash value (excluding interest and dividends) of stock, shares, bonds, debentures, etc.		$1,603,079 00
Cash on deposit to the Company's credit and not drawn against on December 31st, 1917		112,917 82
Agents' balances representing business written subsequent to October 1st, 1917		349,026 70
Cash deposited with Philadelphia Underwriters' Association		100 00
Interest due or accrued and unpaid		12,640 56
Due from other companies for reinsurance on losses already paid		28,986 14
Total assets		$2,106,750 22

Liabilities.

Claims or losses adjusted	$	20,833 41
Claims or losses resisted		3,200 00
Claims or losses in suspense, or supposed, or reported		241,621 48
	$	265,654 89
Deduct reinsurance due or accrued		153,710 53
Net amount of losses or claims unpaid	$	111,944 36
Total reserve of unearned premiums for all outstanding risks		954,521 07
Amount due for taxes and commission		137,678 81
Total amount of liabilities		$1,204,144 24
Capital stock paid up		500,000 00
Total of liabilities and paid-up capital		$1,704,144 24
Excess of assets over such total	$	402,605 98

Receipts.

Net premiums received in cash	$1,137,318 58
Cash received for interest	67,886 31
Cash received from all other sources	310 48
Total receipts	$1,205,515 37

Expenditure.

Cash paid to agents for commission, salaries, and bonus	$ 375,315 11
„ for investigation and adjustment of claims	9,370 87
„ „ taxes, assessments, licences, and fees	59,542 70
„ „ printing, stationery, and advertising	614 22
„ „ postage, telegrams, and express	3 12
„ „ other expenses	443 29
Total expenses of management	$ 445,289 31
Net amount paid for losses occurring prior to 1917	68,524 64
Net amount paid for losses occurring during 1917	463,334 72
Cash paid for dividends	40,000 00
Cash paid for debentures, mortgages, etc. (not extended), $266,665.26.	
Cash paid for other expenditure	8,179 00
Total expenditure	$1,025,327 67

Returns for British Columbia.

Bond of guarantee company in lieu of deposit	$ 25,000 00
Assets (agents' balances)	1,386 39
Liabilities	2,611 28
Premiums written, less return premiums	6,494 64
Losses incurred, net	1,486 01
Losses paid, net	1,412 62
Net amount at risk	513,638 00

INSURANCE OTHER THAN FIRE INSURANCE.

Annual Statements of Provincial Licensees for Year ended December 31st, 1917.

BRITISH COLUMBIA PLATE GLASS INSURANCE COMPANY.

Head Office—Vancouver, B.C.

Officers.

Walter E. Graveley, President ..... Vancouver, B.C.
A. F. Beasley, Vice-President ..... Vancouver, B.C.
Alfred Farmer, Secretary and Treasurer ..... Vancouver, B.C.

Directors.

Walter E. Graveley.
A. F. Beasley.
F. M. Chaldecott.
A. G. Thynne.
A. W. Chamberlain.

Amount deposited with the Government of British Columbia: British Columbia Inscribed Stock, £200; Township of Richmond bonds, $5,000; Dominion of Canada War Loan bonds, $1,000; total (par), $6,972.66.

Authorized capital	$25,000 00
Amount subscribed	9,600 00
Amount paid	3,840 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Cash value (excluding interest and dividends) of stock, shares, bonds, debentures, etc.*	$	10,550 62
Cash on deposit to the Company's credit and not drawn against on December 31st, 1917		3,734 18
Premiums uncollected (net commissions deducted)		2,237 62
Total assets	$	16,522 42

Liabilities.

Total reserve of unearned premiums, $12,381.57; carried out at 80% thereof	$	9,905 25
Total amount of liabilities		9,905 25
Capital stock paid up		3,840 00
Total amount of liabilities and paid-up capital	$	13,745 25

* Taken at cost price.

Receipts.

Net cash received for premiums	$	12,786 64
Cash received for interest		500 43
Cash from all other sources		162 74
Total receipts	$	13,449 81

Expenditure.

Cash paid to agents for commission, salaries, and bonus	$	4,475 32
„ for statutory assessment and licence fees		186 26
„ „ salaries, directors' and auditors' fees		370 00
„ „ printing, stationery, and advertising		4 25
„ „ postage, telegrams, and express		10 00
„ „ other expenses		24 65
Total expenses of management	$	5,070 48
Amount paid for losses occurring during the year		5,065 91
Cash paid for debentures, mortgages (not extended), $2,393.35.		
Total expenditure	$	10,136 39

List of Shareholders.

Name.	Residence.	No. of Shares.	Amount subscribed.	Amount paid.
H. Bell-Irving	Vancouver	5	$ 500	$ 200
W. E. Graveley	"	5	500	200
A. McCreery	"	1	100	40
A. F. Beasley	"	7	700	280
T. O. Richards	"	1	100	40
H. W. Chamberlain	"	5	500	200
H. C. Akroyd	"	1	100	40
D. B. Charleson	"	1	100	40
W. J. Albutt	"	17	1,700	680
Robert Martin	"	1	100	40
Jonathen Rogers	"	2	200	80
A. G. Thynne	"	35	3,500	1,400
F. M. Caldecott	"	5	500	200
Charles E. Hope	"	2	200	80
T. A. Blythe (Estate of)	"	3	300	120
P. W. Charleson	"	5	500	200
		96	$9,600	$3,840

CANTON INSURANCE OFFICE, LIMITED.

Head Office—Victoria, Hong Kong.

Consulting Committee.

The Hon. Mr. David Landale.
E. J. Chapman.
The Hon. Sir Paul Chater, C.M.G.
C. S. Gubbay.
Sir Robert Ho Tung.
The Hon. Mr. E. Shellim.
H. P. White.

General Agents.

Messrs. Jardine, Matheson & Co., Limited, Hong Kong.

Authorized capital	$2,500,000 00
Amount subscribed	2,500,000 00
Amount paid	500,000 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Cash in hand, in transit, and on current account and fixed deposits with banks	*$1,065,769 60
Gold investments—	
British, Indian, and Colonial Government bonds and stocks	2,584,472 62
Foreign Government loans	447,466 67
British, Colonial, and Foreign railway and port trust bonds and stocks	273,370 86
Silver investments—	
Hong Kong Government 6% War Loan of 1916	100,000 00
Mortgages, loans, and debentures	1,587,335 18
Other investments	392,828 18
Agency balances	805,416 81
Accounts receivable	111,858 26
Total assets	$7,368,518 18

Liabilities.

Capital, 10,000 shares of $250 each = $2,500,000, of which $50 per share has been paid up	$ 500,000 00
Reserve Fund	1,200,000 00
Reinsurance Fund	1,157,022 82
Investment and Exchange Fluctuation Account	173,240 28
Underwriting Suspense Account	425,322 53
Uncollected dividends	25,951 00
Accounts payable	119,232 61
Working Account, 1916, as per statement	$719,793 96
Less interim dividend at $18 per share paid on May 3rd, 1917	180,000 00
	539,793 96
Working Account, 1917, as per statement	3,227,954 98
Total liabilities	$7,368,518 18

Working Account, 1916, on December 31st, 1917.

Net premia received, less returns and reinsurances	$3,909,919 12
Interest	258,181 65
Transfer fees	106 00
	$4,168,206 77

* Hong Kong currency. Sterling exchange taken at 3s.

Losses and claims paid	$3,014,285 72
Charges	105,095 62
Commissions	329,031 47
Balance	719,793 96
	$4,168,206 77

Working Account, 1917, on December 31st, 1917.

Net premia received, less returns and reinsurances	$5,700,511 61
Interest	272,726 80
Transfer fees	75 00
	$5,973,313 41
Losses and claims paid	$2,210,693 60
Charges	87,313 01
Donation to war charities	5,000 00
Commissions	442,351 82
Balance	3,227,954 98
	$5,973,313 41

GUARDIAN CASUALTY & GUARANTY COMPANY.

Head Office—Salt Lake City, Utah.

This Company has ceased to transact business in British Columbia.

LONDON & PROVINCIAL MARINE & GENERAL INSURANCE COMPANY, LIMITED.

Head Office—London, England.

Officers.

Edwin Gray, Chairman.
Frank Silverlock, F.C.I.S., Secretary.

Directors.

Edwin Gray.
James W. Arbuthnot.
James Hamilton.
Richard de Neufville.
Herbert E. Secretan.
William M. Strachan.

Authorized capital	£1,000,000
Amount subscribed	1,000,000
Amount paid	100,000

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

	£	s.	d.
By Investments (valued as at December 31st, 1913; investments made since that date are valued at cost)	991,055	0	11
Interest accrued	9,177	18	11
Cash on deposit and at bankers	110,105	16	3
Outstanding accounts due at home and abroad	134,756	13	2
Policy stamps	291	14	4
Total assets	£1,245,387	3	7

Liabilities.

	£	s.	d.
To Authorized capital, 100,000 shares of £10 each, £1,000,000.			
Paid-up capital, 100,000 shares of £10, £1 paid	100,000	0	0
Reserve Fund	150,000	0	0
Sundry creditors	39,568	10	11
Investment reserve	75,000	0	0
Underwriting Suspense Account to meet all claims and other liabilities on 1916 and previous years	196,983	15	9
Balance of Underwriting Account, 1917	609,173	19	4
Balance of Profit and Loss Account	74,660	17	7
Total liabilities	£1,245,387	3	7

Profit and Loss Account.

	£	s.	d.
By Claims on 1916 account	255,002	3	9
Loss on investments realized	146	2	10
Income-tax	4,946	4	4
Dividend	10,000	0	0
Transfer to Reserve Fund	50,000	0	0
Transfer to Underwriting Suspense Account	150,000	0	0
Transfer to investment reserve	50,000	0	0
Balance carried to balance-sheet	74,660	17	7
	£594,755	8	6

	£	s.	d.
To Balance on December 31st, 1916	58,989	15	11
Interest	35,257	6	10
Balance of Underwriting Account, 1916	500,508	5	9
	£594,755	8	6

Underwriting Account.

	£	s.	d.
By Claims to this date	323,759	19	8
Expenses	7,868	3	8
Directors' remuneration and auditors' fee	1,861	0	0
Balance carried to balance-sheet	609,173	19	4
	£ 942,663	2	8

	£	s.	d.
To Premiums (less returns, reinsurances, and agency commissions)	942,663	2	8
	£ 942,663	2	8

MARITIME INSURANCE COMPANY, LIMITED.

Head Office—Liverpool, England.

Officers.

E. H. Cookson, Chairman.
J. F. Caroe, Deputy Chairman.
Harold Sumner, Manager.
J. C. Nicholson, Secretary.

Directors.

E. H. Cookson.
J. F. Caroe.
Wm. C. Aikman.
J. A. Cook.
Jasper M. Wood.

Authorized capital	£1,000,000
Amount subscribed	500,000
Amount paid	100,000

Statement for the Year ended December 31st, 1917.

Assets.

	£	s.	d.
By Investments	1,083,850	8	7
Sundry debtors	174,203	1	6
Interest and dividends accrued, but not payable until after December 31st, 1917	2,914	13	8
Cash on deposit, in hand, and on current account	90,834	3	11
Total assets	£1,351,802	7	8

Liabilities.

	£	s.	d.
To Shareholders' capital paid up	100,000	0	0
General Reserve Fund	200,000	0	0
Underwriting Fund	860,236	5	3
Profit and Loss Account	135,890	17	6
	£1,296,127	2	9
Sundry creditors	55,675	4	11
Total liabilities	£1,351,802	7	8

Profit and Loss Account.

		£	s.	d.
By Dividend paid March 6th, 1917	£10,000 0 0			
Less income-tax	2,498 13 11			
		7,501	6	1
Interim dividend paid July 3rd, 1917	£10,000 0 0			
Less income-tax	2,500 0 0			
		7,500	0	0
Income-tax paid		24,864	0	0
Excess profits duty paid and provided for		50,000	0	0
Amount written off for depreciation in investments		6,000	0	0
Balance at December 31st, 1917, subject to further excess profits duty (if any)		135,890	17	6
	£	231,756	3	7

	£	s.	d.
To Balance, January 1st, 1917	105,565	18	9
Interest and dividends £54,018 1 9			
Less income-tax 7,827 16 11			
	46,190	4	10
Transferred from Underwriting Account	80,000	0	0
	£ 231,756	3	7

Underwriting Account.

	£	s.	d.
By Claims paid after deducting reinsurance recoveries	614,716	17	3
Expenses of management	56,351	8	3
Transferred to Profit and Loss Account	80,000	0	0
Underwriting Fund, December 31st, 1917—			
Reserve of 50 per cent. of net premiums £461,004 2 0			
Additional reserve, including provision for unsettled claims 399,232 3 3			
	860,236	5	3
	£1,611,304	10	9

	£	s.	d.
To Underwriting Fund, January 1st, 1917	689,296	6	8
Premiums after deducting returns and reinsurance premiums	922,008	4	1
	£1,611,304	10	9

NATIONAL PLATE GLASS INSURANCE COMPANY.

Head Office—Winnipeg, Man.

Officers.

I. Pitblado, President ..... Winnipeg, Man.
E. Cass, Vice-President ..... Winnipeg, Man.
W. E. Lough, Secretary-Treasurer ..... Winnipeg, Man.

Directors.

I. Pitblado.	J. McDiarmid.	W. E. Lough.
E. Cass.	R. A. Mather.	R. W. Patterson.

Amount deposited with the Government of British Columbia: City of Salmon Arm bonds, $5,000; City of Nelson bonds, $300; City of Alberni bonds, $210; total (par), $5,510.

Authorized capital	$30,000 00
Amount subscribed	15,000 00
Amount paid	5,430 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Cash value of real estate, less encumbrances	$	416 18
Cash value of mortgages, exclusive of interest		3,550 00
Cash value of stocks, shares, debentures, etc.		8,167 36
Agents' balances and premiums uncollected		983 64
Interest due or accrued and unpaid		523 05
Amount of all other assets		134 52
Total assets	$	13,774 75

Liabilities.

Amount of unpaid loans	$	205 94
Total reserve of unearned premiums for all outstanding risks		2,282 35
Amount of all other liabilities		1,418 62
Total amount of liabilities	$	3,906 91
Capital stock paid up		5,430 00
Total of liabilities and paid-up capital	$	9,336 91
Excess of assets over such total	$	4,437 84

Receipts.

Net premiums received in cash	$	2,758 69
Cash received for interest		678 50
Cash received from all other sources		79 10
Total cash receipts	$	3,516 29

Expenditure.

Cash paid to agents for commission, salaries, and bonus	$	420 97
" for law costs		7 55
" " statutory assessment and licence fees		122 64
" " interest and exchange		8 40
" " salaries, directors' and auditors' fees		535 00
" " printing, stationery, and advertising		3 00
" " postage, telegrams, and express		10 80
Total expenses of management	$	1,108 36
Net amount paid for losses or claims		2,437 82
Cash paid for repayment of loans		250 00
	$	3,796 18

RETURNS FOR BRITISH COLUMBIA.

Deposit with Government, municipal securities (par)	$	5,510 00
Other assets (accrued interest)		100 04

(No business transacted during 1917).

THE OCEAN MARINE INSURANCE COMPANY, LIMITED.

Head Office—London, England.

Officers.

Hon. Charles Napier Lawrence, Chairman.
Sir Alex. Drake Kleinwort, Bart., Deputy Chairman.
H. T. Russell Ross, Secretary.

Directors.

Hon. Charles Napier Lawrence.
Sir Alex. Drake Kleinwort.
Herbert Robinson Arbuthnot.
John Henry Brodie.
James Blyth Currie.
Philipp Moritz Deneke.
Maurice Ruffer.
Philip Secretan.
David Nairn Shaw.

Authorized capital	£1,000,000
Amount subscribed	1,000,000
Amount paid	100,000

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

	£	s.	d.
British Government securities	279,249	18	5
Municipal and county securities, United Kingdom	23,390	0	0
Indian and Colonial Government securities	91,377	15	0
Foreign Government securities	90,605	6	8
Colonial municipal securities	23,115	12	6
Foreign municipal securities	67,090	7	1
Guaranteed and other Indian railway stock	24,436	5	0
Indian Government railway annuities	8,187	10	0
Railway and other debentures and debenture stocks, home and foreign	163,394	0	0
Railway preference and guaranteed stocks	9,000	12	8
Railway ordinary stocks	16,985	16	0
Loans on stocks and shares	233,437	10	0
	£1,030,270	13	4
Freehold premises	127,000	0	0
	£1,157,270	13	4
Agents' balances	114,668	8	6
Outstanding premiums, etc.	89,961	19	2
Bills receivable	1,688	6	3
Interest accrued but not yet payable	10,952	17	5
Policy stamps on hand	209	2	7
Cash—			
On deposit	103,491	5	0
In hand and on current account	16,368	12	3
	£1,494,611	4	6

Liabilities.

	£	s.	d.
Capital, 40,000 shares of £25, paid up £2 10s. per share (now vested in the North British and Mercantile Insurance Company)	100,000	0	0
Marine Fund—			
Reserve £500,000 0 0			
Profit and loss 134,682 17 7			
	643,682	17	7
Underwriting Reserve	89,073	15	1
Balance of Underwriting Account, 1917	395,962	16	6
Sundry creditors	274,891	15	4
	£1,494,611	4	6

Underwriting Account, 1916.

	£	s.	d.
Net claims under policies and returns for 1916 paid in 1917	128,163	2	9
Transferred to Underwriting Reserve for balance of 1916 claims	79,633	0	0
Profit on 1916 Underwriting Account carried to Profit and Loss	63,957	15	6
	£ 271,753	18	3
Balance from 1916 Underwriting Account	£ 271,753	18	3

Underwriting Account, 1917.

	£	s.	d.
Net claims under policies and agency expenses for 1917	334,995	12	6
Expenses of management	29,099	16	1
Balance of 1917 Underwriting Account carried forward	395,962	16	6
	£ 760,058	5	1
Net premiums for 1917	£ 760,058	5	1

Profit and Loss Account, 1917.

	£	s.	d.
Dividends declared on account of 1917, less tax	18,750	0	0
Income-tax	8,641	15	0
Depreciation in value of securities	18,724	14	1
Amount written off freehold premises	1,000	0	0
Balance carried to balance-sheet	134,682	17	7
	£ 181,799	6	8

	£	s.	d.
Balance brought forward	74,715	8	2
Profit on 1916 Underwriting Account	63,957	15	6
Interest and rent received and accrued	43,126	3	0
	£ 181,799	6	8

QUEENSLAND INSURANCE COMPANY, LIMITED.

Head Office—Sydney, Australia.

Officers.

Col. the Hon. Sir James Burns, K.C.M.G., M.L.C., Chairman.
A. McVernon, General Manager.
C. Hawkes, Assistant Manager and Branch Inspector.
H. W. Horn, Secretary.

Directors.

Col. the Hon. Sir James Burns, K.C.M.G., M.L.C.
Adam Forsyth. Hon. Thomas Waddell, M.L.C.
A. R. Troup. W. T. MacPherson.

Authorized capital	£500,000
Amount subscribed	250,000
Amount paid	250,000

STATEMENT FOR THE YEAR ENDED SEPTEMBER 30TH, 1917.

Assets.

By Government securities: South Australian State Bank Bonds; New Zealand War Loan; British War Loan; Commonwealth of Australia War Loan; New South Wales Government Funded Stock; New South Wales Government Treasury Bills; New Zealand Government Debentures; Queensland Government Savings Bank Stock; Queensland Government Treasury Bills; Queensland Government Debentures; South Australian Government Inscribed Stock; Western Australian Government Inscribed Stock; Victorian Government Deposit; Queensland Government Deposit	£183,073	14	10			
Fixed deposits with the undermentioned banks, etc.: Bank of Queensland, Ltd.; Union Bank of Australia, Ltd.; Queensland National Bank, Ltd.; Bank of New South Wales; Western Australian Bank; English, Scottish & Australian Bank, Ltd.; London Bank of Australia, Ltd.; Commercial Banking Co. of Sydney, Ltd.; Commercial Bank of Australia, Ltd.; Australian Bank of Commerce, Ltd.; National Bank of Tasmania, Ltd.; Commercial Bank of Tasmania, Ltd.; Bank of Victoria; Bank of Australasia; Wellington Trust Loan & Investment Co., Ltd.; Metropolitan Gas Co.	176,250	0	0			
Municipal debentures	45,315	0	0			
Freehold properties	110,918	2	3			
Cash deposits at call	62,000	0	0			
Cash in hand and at bankers	17,244	4	5			
				£	s.	d.
				594,801	1	6
Sundry debtors				4,785	13	10
Premiums outstanding				15,060	16	0
Reinsurance claims, return premiums, and refunds outstanding				9,063	1	8
Branch and agency balances				13,410	9	5
				£637,121	2	5

Liabilities.

	£	s.	d.
To Authorized capital, 500,000 shares of £1 each, £500,000. Subscribed capital, 250,000 shares of £1 each	250,000	0	0
Reserve Fund	50,000	0	0
Unearned premiums	140,589	0	0
Officers' Provident Fund	14,391	8	5
Sundry creditors, reinsurances, claims, and provision for taxation	124,421	18	1
Revenue Account	57,718	15	11
	£637,121	2	5

Revenue Account.

	£	s.	d.
By Premiums, less reinsurances, returns, and unearned	252,665	12	9
Interest and rents	25,624	0	4
	£278,289	13	1

	£	s.	d.
To Losses	113,472	10	1
Charges	89,425	5	11
Land, income, and other taxes	13,758	13	5
War bonus to staff	2,055	0	0
Officers' Provident Fund	2,000	0	0
Balance	57,578	3	8
	£278,289	13	1

				£	s.	d.
By Balance brought down				57,578	3	8
Balance at September 30th, 1916			£62,390	12	3	
Less dividend at 10 per cent. per annum paid	£25,000	0	0			
Less bonus at 2½ per cent. per annum paid	6,250	0	0			
Amount to Reserve Fund	25,000	0	0			
Provision for taxation	6,000	0	0			
			62,250	0	0	
				140	12	3
Balance			£	57,718	15	11

THE RELIANCE MARINE INSURANCE COMPANY, LIMITED.

Head Office—Liverpool, England.

Officers.

Gilbert W. Fox, Chairman.
J. U. Hodgson, Deputy Chairman.
F. R. Edwards, Secretary.

Directors.

Gilbert W. Fox.	Lt.-Col. F. R. S. Balfour.	R. A. Love.
J. U. Hodgson.	Oswald Dobell.	R. W. Sharples.
George Atherton.	Robert L. Hunter.	

Authorized capital	£500,000
Amount subscribed	500,000
Amount paid	100,000

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

By Investments—			
Bonds repayable at fixed dates	£329,515 19 11		
Other investments at market value	122,907 13 3		
		£ s. d.	
		452,423 13 2	
Policy stamps		231 15 1	
Cash at bankers and in hand		15,908 7 4	
Interest accrued but not received		3,494 14 4	
Account due to the Company for premiums, salvages, etc.		109,979 0 11	
		£582,037 10 10	

Liabilities.

		£ s. d.	
To Capital, 50,000 shares at £10 per share, £500,000; paid up £2 per share		100,000 0 0	
Reserve Fund		150,00 0 0	
Balance of Profit and Loss Account	£76,564 19 10		
Less interim dividend paid July 1st, 1917	7,500 0 0		
		69,064 19 10	
Balance of Marine Account, 1917		164,199 18 6	
Fire Insurance Fund		20,485 4 8	
Suspense and Special Reinsurance Accounts		48,941 16 0	
Accounts due by the Company		29,320 0 1	
Dividends unpaid		25 11 9	
		£582,037 10 10	

Profit and Loss Account.

By Dividend paid to shareholders—			
July 1st, 1916	£8,000 0 0		
January 30th, 1917	7,500 0 0		
		£ s. d.	
		15,500 0 0	
Income-tax, 1916, and excess profits duty (on account)		10,106 0 0	
Claims, reinsurances, returns, commissions, etc., for 1916		98,391 17 3	
Amount carried to Suspense Account to close 1916		17,000 0 0	
Subscriptions to War Relief Funds		345 0 0	
Amount transferred to Fire Account		10,000 0 0	
Amount written off investments		24,000 0 0	
Balance carried down		76,564 19 10	
		$251,907 17 1	

	£	s.	d.
To Balance, January 1st, 1917	78,512	19	2
Balance of Underwriting Account, 1916	154,884	9	1
Interest Account, less income-tax thereon	18,510	8	10
	$251,907	17	1

Marine Account.

	£	s.	d.
By Claims	85,519	12	3
General expenses, including remuneration of directors and auditors	17,227	3	5
Balance carried down	164,199	18	6
	£266,946	14	2

	£	s.	d.
To Premiums, less reinsurances, returns, and agency charges, etc.	266,945	19	2
Transfer fees	0	15	0
	£266,946	14	2

Fire Account.

	£	s.	d.
By Claims paid and outstanding	6,926	9	11
Commission and expenses	3,548	2	8
Amount of Fire Insurance Fund—			
Premium Reserve (45 per cent.) £ 9,150 0 0			
General Reserve Fund 11,335 4 8			
	20,485	4	8
	£ 30,959	17	3

	£	s.	d.
To Balance brought forward from 1916	662	8	6
Premiums, less reinsurances	20,297	8	9
Transferred from Profit and Loss Account	10,000	0	0
	£ 30,959	17	3

ROYAL PLATE GLASS INSURANCE COMPANY OF CANADA.

Head Office—Vancouver, B.C.

Officers.

Dr. D. H. Wilson, President ..... Vancouver, B.C.
W. H. Malkin, Vice-President ..... Vancouver, B.C.
C. A. Wickens, Secretary and Treasurer ..... Vancouver, B.C.

Directors.

Dr. D. H. Wilson.	W. H. Malkin.	A. P. Bogardus.
J. P. Nicolls.	R. W. Harris.	C. A. Wickens.

Amount deposited with the Government of British Columbia: Deposit receipt of Canadian Bank of Commerce, $125; Dominion War Loan bonds (par), $5,000; total, $5,125.

Authorized capital	$25,000 00
Amount subscribed	10,000 00
Amount paid	2,750 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Cash value of mortgages, exclusive of interest	$	2,250 00
Cash value (excluding interest and dividends) of stock, shares, bonds, debentures, etc.		5,075 00
Cash deposited with Government		125 00
Cash on deposit to the Company's credit and not drawn against on December 31st, 1917		681 96
Agents' balances and premiums uncollected		805 01
Interest due or accrued and unpaid		109 30
Total assets	$	9,046 27

Liabilities.

Reserve of unearned premiums, $2,619.01; carried out at 80 per cent. thereof	$	2,095 20
Amount of all other liabilities		391 24
Total amount of liabilities	$	2,486 44
Capital stock paid up		2,750 00
Total of liabilities and paid-up capital	$	5,236 44
Excess of assets over such total	$	3,809 83

Receipts.

Net cash received for premiums	$	1,232 32
Cash received for interest		409 27
Total receipts	$	1,641 59

Expenditure.

Cash paid to agents for commission, salaries, and bonus	$	369 69
„ for interest, discount, and exchange		40
„ „ statutory assessment and licence fees		33 79
„ „ salaries, directors' and auditors' fees		45 00
„ „ printing, stationery, and advertising		1 45
„ „ postage, telegrams, and express		30
Total expenses of management	$	450 63
Amount paid for losses occurring prior to 1917		135 61
Amount paid for losses occurring during 1917		1,323 05
Cash paid for other expenditure		212 03
Total expenditure	$	2,121 32

List of Shareholders.

Name.	Residence.	No. of Shares.	Amount subscribed.	Amount paid.
A. P. Bogardus	Vancouver	10	$1,000	$275 00
D. H. Wilson	„	14	1,400	385 00
R. W. Harris	„	14	1,400	385 00
W. H. Malkin	„	14	1,400	385 00
C. A. Wickens	„	8	800	220 00
P. G. Mason	„	8	800	220 00
J. P. Nicolls	„	5	500	137 50
I. Douglas	Boston, U.S.A.	12	1,200	330 00
M. Douglas	„	5	500	137 50
R. D. Douglas	Binghampton, U.S.A.	5	500	137 50
N. S. Douglas	„ „	5	500	137 50
		100	$10,000	2,750 00

THE YANG-TSZE INSURANCE ASSOCIATION, LIMITED.

Head Office—Shanghai, China.

Officers.

John Prentice, Chairman.
C. W. Wrightson, Deputy Chairman.
W. S. Jackson, General Manager.
T. A. Clark, Secretary.

Directors.

John Prentice.	B. A. Clarke.	H. E. Arnhold.
C. W. Wrightson.	A. W. Burkill.	A. I. D. Stewart.

Authorized capital	$1,200,000 00
Amount subscribed	1,200,000 00
Amount paid	720,000 00

STATEMENT FOR THE YEAR ENDED DECEMBER 31ST, 1917.

Assets.

Midland Railway Co. Consolidated Perpetual Preference Stock, £3,603		$ *23,000 93
Great Northern Railway Co. Consolidated 4% Perpetual Preference Stock, £1,065		6,798 77
London and North Western Railway Co. Consolidated 4% Preference Stock, £1,850		11,810 07
Great Western Railway Co. 4% Debenture Stock, £1,012		6,460 42
Great Western Railway Co. 4¼% Debenture Stock, £1,680		10,724 82
India 3½% Stock, 1931, £1,165		7,437 15
British Government 4½% War Loan, £14,925		95,278 63
British Government Exchequer Bonds, £20,350		129,910 89
Queensland Government 4½% Debenture Stock, £1,000		6,383 82
Anglo-French 5% External Loan Bonds, G. $88,500		118,565 16
City of New York 4% Corporate Stock, G. $97,893.75		131,150 15
City of New York 4½% Corporate Stock, G. $81,175		108,751 72
Northern Pacific, Great Northern, and Chicago, Burlington & Quincy Railroad Joint 4% Bonds, G. $23,437.50		31,399 67
Southern Railway First Consolidated Mortgage 5% Bonds, G. $23,437.50		31,399 67
Baltimore and Ohio Railway 4½% Equipment Bonds, G. $23,500		31,483 40
American Telephone & Telegraph Co. 4½% Bonds, G. $25,000		33,492 99
Big Four Railway Co. 5% Equipment Bonds, G. $24,500		32,823 12
New York Central Railway 4½% Bonds, G. $23,500		31,483 40
Liberty 3½% Bonds, 1947, G. $14,790		19,814 45
Liberty 4% Bonds, 1942, G. $48,600		65,110 37
Loans and mortgages		1,625,483 62
Japanese Imperial Government New 4% Loan		56,726 03
Japanese Imperial Government 5% Railway Bonds		52,077 26
Straits Settlements 6% War Loan		75,342 46
Cash at bankers on fixed deposit and current account—		
In gold	$1,126,839 93	
In silver	666,959 28	
		1,793,799 21
Property, land, Head Office, and other buildings		533,002 65
Shanghai Land Investment Co., Ltd., debentures		161,610 95
Shanghai municipal debentures		81,178 09
Shanghai Waterworks Co., Ltd., debentures		26,198 63
Shanghai & Hongkew Wharf Co., Ltd., debentures		8,150 68
Investments in stocks and shares		416,666 85
Policy stamps at agencies		721 86
Head Office and agencies, furniture		7,144 95
Due by agencies, premia in course of collection, and sundry outstandings		1,156,520 45
		$6,927,903 29

* Hong Kong currency. Sterling exchange taken at 4s. 3½d.

Liabilities.

Capital, 12,000 shares of $100 each, upon which the sum of $60 per share has been called and fully paid up		$ 720,000 00
Reserve Fund		1,000,000 00
Reinsurance Reserve Fund		1,000,000 00
Building Reserve Fund	$150,000 00	
Less value of old building written off	33,720 80	
		116,279 20
Investment and Exchange Reserve Fund	$500,000 00	
Less Exchange depreciation	396,882 80	
		103,117 20
Working Account, 1917		3,186,480 97
Working Account, 1916 and former years		799,323 56
Uncollected dividends		2,702 36
		$6,927,903 29

Working Account for Twelve Months ending December 31st, 1917.

By Claims paid, less recovered under reinsurances, etc.		$1,694,456 23
Commissions and charges at Head Office, branches, and agencies		407,681 81
Directors', committees', and auditors' fees		7,529 75
Balance		3,186,480 97
		$5,296,148 76
To Net premia, less reinsurance, etc.		$4,999,063 29
Interest, dividends, and rents		297,042 09
Transfer fees		43 38
		$5,296,148 76

Working Account, 1916 and Former Years.

By Net claims, reinsurance premia, and premia returned, etc., account 1916		$1,753,453 19
Special dividend, 1916 account, $3 per share on 12,000 shares		36,000 00
Donation to Sailors' War Orphans' Fund, £1,000		5,731 34
Amount transferred to Investment and Exchange Reserve Fund, 1917		250,000 00
Amount transferred to Investment and Exchange Reserve Fund, 1916		250,000 00
Dividend, former years account, $15 per share on 12,000 shares		180,000 00
Net claims and all payments account former years		61,027 25
Balance		799,323 56
		$3,335,535 34
To Balance of Working Account, 1916, from last account		$2,254,518 25
Balance of Working Account, former years, from last account		1,081,017 09
		$3,335,535 34

LIST OF INSURANCE COMPANIES LICENSED TO TRANSACT THE BUSINESS OF FIRE INSURANCE IN BRITISH COLUMBIA UNDER THE "BRITISH COLUMBIA FIRE INSURANCE ACT," DECEMBER 31ST, 1917.

Name of the Company and Head Office.	Attorney to receive Process in British Columbia. (Corrected to July 8th, 1918.)	Deposits of Companies other than Dominion Licensees.
The Acadia Fire Insurance Company, Halifax, N.S.	Ceperley, Rounsefell & Co., Ltd., Vancouver	
Aetna Insurance Company, Hartford, Conn	J. E. Kinsman, Victoria	
Agricultural Insurance Company, Watertown, N.Y.	R. S. Heddle, Vancouver	
Alliance Assurance Company, Limited, London, England	W. A. Anderson and H. Miskin, Vancouver	
Alliance Insurance Company of Philadelphia	H. N. Galer, Vancouver	
American Central Insurance Company, St. Louis, Missouri	B. S. Heisterman, Victoria	
Atlas Assurance Company, Limited London, England	John S. Gall, Vancouver	
Beaver Fire Insurance Company, Winnipeg, Man	Waghorn, Gwynn & Co., Ltd., Vancouver	
Boston Insurance Company, Boston, Mass.	A. Z. DeLong, Vancouver	Bond $25,000—Canadian Surety Company.
British America Assurance Company, Toronto, Ont.	P. R. Brown, Victoria	
British Colonial Fire Insurance Company, Montreal, Que.	E. D. McDermid, Vancouver	
British Crown Assurance Corporation, Ltd., Glasgow, Scotland	A. S. Matthew, Vancouver	
British North Western Fire Insurance Company, Winnipeg, Man	F. Carter-Cotton, Vancouver	
Caledonian Insurance Company, Edinburgh, Scotland	A. W. Jones, Victoria	
California Insurance Company, San Francisco, Cal.	A. W. Ross, Vancouver	
Canada Accident Assurance Co., Montreal, Que.	John Hart, Victoria	
Canada National Fire Insurance Company, Winnipeg, Man	R. W. Perry, Victoria	
Canadian Fire Insurance Company, Winnipeg, Man.	F. C. Paterson, Victoria	
The Century Insurance Company, Limited, Edinburgh, Scotland	Thos. W. Greer, Vancouver	
Citizens Insurance Company of Missouri, St. Louis, Mo.	R. A. Corbet, Vancouver	
Commercial Union Assurance Company, Limited, London, England	A. W. Ross, Vancouver	
Commercial Union Fire Insurance Company of New York.	A. W. Ross, Vancouver	
Connecticut Fire Insurance Company, Hartford, Conn	Robert H. Swinerton, Victoria	
Continental Insurance Company, New York, N.Y.	W. A. Lawson, Vancouver	
*Detroit Fire & Marine Insurance Company, Detroit, Michigan	W. J. Albutt, Vancouver	Bond $25,000—Canadian Surety Co.
Dominion Fire Insurance Company, Toronto, Ontario	G. H. L. Hobson, Vancouver	
The Dominion of Canada Guarantee & Accident Insurance Company, Toronto, Ont.	H. W. Falconer, Vancouver	
The Eagle & British Dominions Insurance Company, Ltd., London, England	R. J. Loewen and R. G. Harvey, Vancouver	
Employers Liability Assurance Corporation, Limited, London, England	D. C. McGregor, Vancouver	
Equitable Fire & Marine Insurance Company, Providence, R.I	A. M. Pound, Vancouver	
Fidelity Phenix Fire Insurance Company, New York, N.Y.	Arthur Coles, Victoria	
Fire Association of Philadelphia, Philadelphia, Pa	Leeming Bros., Ltd., Victoria	Bond $25,000—Canadian Surety Co.
Fireman's Fund Insurance Company, San Francisco, Cal.	John Hart, Victoria	
Firemen's Insurance Company of Newark, New Jersey	Alexander Dow, Vancouver	
General Accident Fire & Life Assurance Corporation, Limited, Perth, Scotland	E. J. Enthoven, Vancouver	
General Fire Assurance Company, Paris, France	W. S. Holland, Vancouver	
German American Insurance Company, New York, N.Y.	R. W. Douglas, Victoria	
Glens Falls Insurance Company, Glens Falls, N.Y	G. L. Hobson, Vancouver	
Globe & Rutgers Fire Insurance Company, New York, N.Y.	H. Bell-Irving & Co., Ltd., Vancouver	
Globe Indemnity Co. of Canada, Montreal, Que.	F. W. Rounsefell, Vancouver	
Guardian Assurance Company, Limited, London, England	R. S. Day, Victoria	
Hartford Fire Insurance Company, Hartford, Conn	George Allan Kirk, Victoria	
Home Insurance Company, New York, N.Y.	R. Kerr Houlgate, Vancouver	
Hudson Bay Insurance Company, Montreal, Que.	F. W. Walker, Vancouver	
†Imperial Guarantee & Accident Insurance Company of Canada, Toronto, Ont.	Donald Cramer, Vancouver	
Imperial Underwriters Corporation of Canada, Toronto	A. Waring Giles, Vernon	
*Industrial Fire Insurance Co., Akron, O.	H. A. Robertson, Vancouver	Bond $25,000—United States Fidelity & Guaranty Co.
Insurance Company of North America, Philadelphia, Pa.	Edward Odlum, Vancouver	
The Insurance Company of the State of Pennsylvania, Philadelphia, Pa.	Charles A. McMorran, Vancouver	
Law, Union & Rock Insurance Company, Limited, London, Eng.	R. S. Day, Victoria	
Liverpool & London & Globe Insurance Company, Limited, Liverpool, England	Richard Hall, Victoria	
Liverpool-Manitoba Assurance Company, Montreal, Quebec	L. U. Conyers, Victoria	

London Assurance Corporation, London, Eng	Harold B. Girdwood, Victoria	
London & Lancashire Fire Insurance Company, Ltd., Liverpool, England	Wm. Thompson, Vancouver	
London Guarantee & Accident Co., Ltd., London, England	J. H. Watson, Vancouver	
London Mutual Fire Insurance Company of Canada, Toronto, Ont	Christopher G. Hobson, Vancouver	
‡Marine Insurance Company, Limited, London, England	W. W. Johnston, Vancouver	
Mechanics & Traders Insurance Company, New Orleans, La	J. W. Allen, Vancouver	Bond $25,000—United States Fidelity & Guaranty Co.
Mercantile Fire Insurance Company, Waterloo, Ontario	Wm. Thompson, Vancouver	
Merchants Fire Assurance Corporation of New York, N.Y	C. G. Hobson, Vancouver	Bond $25,000—Canadian Surety Company.
*Michigan Fire & Marine Insurance Company, Detroit, Michigan	W. A. Ragsdale, Vancouver	Bond $25,000—Canadian Surety Company.
Millers National Insurance Company, Chicago	C. G. Hobson, Vancouver	
Minneapolis Fire & Marine Insurance Company, Minneapolis, Minn	Chalmers Rutherford, Vancouver	Bond $25,000—Canadian Surety Company.
Mount Royal Assurance Company, Montreal, Quebec	C. G. Hobson, Vancouver	
National Ben Franklin Fire Insurance Company, Pittsburgh, Pa	J. H. Johnston, Victoria	
National Benefit Life & Property Assurance Co., Ltd., London, Eng	B. J. Jayne, Vancouver	{ Municipal Securities, $23,095. { C.P.R. Notes, $2,500.
National Fire Insurance Company of Hartford, Hartford, Conn	H. T. Barnes, Victoria	
The Nationale Fire Insurance Company, Paris, France	C. G. Hobson, Vancouver	
National Union Fire Insurance Company, Pittsburgh, Pa	E. E. Rand, Vancouver	
Newark Fire Insurance Company, Newark, N.J	F. W. Walker, Vancouver	Bond $25,000—United States Fidelity & Guaranty Co.
New Jersey Fire Insurance Company, Newark, N.J	H. A. Robertson, Vancouver	Bond $25,000—Canadian Surety Company.
Niagara Fire Insurance Company, New York, N.Y	D. Leeming, Victoria	
Northern Assurance Company, Limited, London, England	Bernard C. Mess, Victoria	
North British & Mercantile Insurance Company, London, Eng	E. E. Hill, Vancouver	
North Empire Fire Assurance Company, Winnipeg, Manitoba	John W. Wilson, Vancouver	
North West Fire Insurance, Winnipeg, Manitoba	Chas. H. C. Payne, Victoria	
Northwestern Mutual Fire Association, Seattle, Washington	N. B. Whitley, Vancouver	Bond $25,000—Canadian Surety Co.
Northwestern National Insurance Company, Milwaukee, Wis	G. V. J. Greenhill, Victoria	
Norwich Union Fire Insurance Society, Limited, Norwich, England	B. S. Heisterman, Victoria	
Ocean Accident & Guarantee Corporation, Limited, London, England	John R. Hannah, Vancouver	
Occidental Fire Insurance Company, Winnipeg, Man	A. E. Short, Vancouver	
Pacific Coast Fire Insurance Company, Vancouver, B.C	Thos. W. Greer, Vancouver	
*Pacific Fire Insurance Company, New York, N.Y	H. A. Robertson, Vancouver	Bond $25,000—Canadian Surety Company.
*Pacific States Fire Insurance Company, Portland, Oregon	W. A. Ward, Vancouver	Municipal Securities, $25,000.
Palatine Insurance Company, Limited, London, England	A. W. Ross, Vancouver	
The Phenix Fire Insurance Company of Paris, France	J. A. Griffith, Victoria	
Phoenix Assurance Company, Limited, London, England	F. W. Rounsefell, Vancouver	
The Phoenix Insurance Company, Hartford, Conn	Arthur E. Haynes, Victoria	
Providence Washington Insurance Company, Providence, R.I	Richard W. Douglas, Vancouver	
Provincial Insurance Co., Ltd., Bolton, England	A. Z. DeLong, Vancouver	
Quebec Fire Assurance Company, Quebec, Que	Wm. Thompson, Vancouver	
Queen Insurance Company of America, New York	R. P. Rithet & Co., Ltd., Victoria	
*The Reliance Insurance Company of Philadelphia	Henry J. Landahl, Vancouver	Bond $25,000—United States Fidelity & Guaranty Co.
Rhode Island Insurance Company, Providence, R.I	H. T. Devine & Co., Ltd., Vancouver	Bond $25,000—Canadian Surety Company.
Royal Exchange Assurance, London, England	H. G. Lawson, Jr., Victoria	
Royal Insurance Company, Limited, Liverpool, England	F. W. Walker, Vancouver	
St. Paul Fire & Marine Insurance Company, St. Paul, Minn	B. S. Heisterman, Victoria	
Scottish Union & National Insurance Company, Edinburgh, Scotland	Pemberton & Sons, Victoria	
Springfield Fire & Marine Insurance Company, Springfield, Mass	Chas. H. Macaulay, Vancouver	
Stuyvesant Insurance Company, New York, N.Y	H. A. Robertson, Vancouver	
Sun Insurance Office London, England	F. B. Pemberton, Victoria	
*Svea Fire & Life Insurance Company, Limited, Gothenburg, Sweden	Thynne & Albutt, Vancouver	Bond $25,000—National Surety Company.
Union Assurance Society, Limited, London, England	D. C. McGregor, Vancouver	
The Union Fire Insurance Company, Paris, France	Franco-Canadian Trust & Mortgage Co., Vancouver	
Union Insurance Society of Canton, Ltd., Victoria, Hong Kong	C. R. Elderton, Vancouver	
‖Union Marine Insurance Company, Limited, Liverpool, England	C. H. Macaulay, Vancouver	Can. Nor. Pacific Ry. Terminal Debenture Stock, $20,000.
Vulcan Fire Insurance Company of Oakland, California	T. W. Greer, Vancouver	Bond $25,000—National Surety Company.

LIST OF INSURANCE COMPANIES—*Concluded.*

Name of the Company and Head Office.	Attorney to receive Process in British Columbia. (Corrected to July 8th, 1918.)	Deposits of Companies other than Dominion Licensees.
Western Assurance Company, Toronto, Ontario	W. Wyllie Johnston, Vancouver	
Westchester Fire Insurance Company, New York, N.Y.	R. N. Ferguson, Victoria	
Yorkshire Insurance Company, Limited, York, England	H. W. Dyson, Vancouver	

* Withdrawing from this Province.

† Licence under "B.C. Fire Insurance Act," limited to insurance of automobiles against fire; also licensed under the "Insurance Act" to transact guarantee, accident, sickness, automobile, and plate-glass insurance.

‡ Licence under "B.C. Fire Insurance Act," limited to insuring automobiles against loss or damage by fire; also licensed under the "Insurance Act" to transact automobile and inland transportation insurance.

‖ Licence under "B.C. Fire Insurance Act," limited to insuring automobiles against loss or damage by fire; also licensed under the "Insurance Act" to transact marine, inland marine, inland transportation, automobile, and accident insurance.

NOTE.—Licensed since December 31st, 1917:

American Alliance Insurance Co., New York, N.Y.; O. D. Lampman, Vancouver. Bond $25,000—National Surety Company.

British Traders Insurance Co., Ltd., Victoria, Hong Kong; C. R. Elderton, Vancouver.

New Hampshire Fire Insurance Co., Manchester, N.H.; A. Z. DeLong, Vancouver.

NET FIRE INSURANCE PREMIUMS AND NET LOSSES, 1917.

Name of Company.	Net Premiums.	Net Amount of Losses incurred.	Net Amount of Losses paid.
Acadia Fire Insurance Co.	$ 19,693 66	$ 4,131 77	$ 3,029 37
Aetna Insurance Co.	52,491 31	19,545 80	24,535 26
Agricultural Insurance Co.	10,587 20	916 00	1,169 31
Alliance Assurance Co., Ltd.	31,198 06	5,789 99	5,655 15
Alliance Insurance Co. of Philadelphia	18,437 90	8,423 29	8,015 29
American Central Insurance Co.	8,600 41	2,366 52	1,446 71
Atlas Assurance Co.	24,938 92	9,125 62	9,125 62
Beaver Fire Insurance Co.	6,075 49	33 27	17 27
Boston Insurance Co.	19,478 62	12,506 22	12,506 22
British America Assurance Co.	57,110 62	17,451 69	17,069 69
British Colonial Fire Insurance Co.	15,815 00	7,750 40	6,169 68
British Crown Assurance Corporation, Ltd.	34,404 98	24,472 78	22,174 78
British North Western Fire Insurance Co.	4,245 06	730 82	730 82
Caledonian Insurance Co.	39,643 99	11,146 41	11,140 31
California Insurance Co.	26,811 02	2,323 53	2,342 23
Canada Accident Assurance Co.	11,750 97	2,038 84	2,029 04
Canada National Fire Insurance Co.	35,592 90	7,101 32	5,136 99
Canadian Fire Insurance Co.	29,029 67	9,582 16	7,362 82
Century Insurance Co., Ltd.	10,186 00	296 95	841 88
Citizens Insurance Co., Ltd.	11,969 79	678 23	699 58
Commercial Union Assurance Co., Ltd.	104,969 23	41,903 94	40,612 07
Commercial Union Fire Insurance Co. of N.Y.	7,000 14	962 38	971 58
Connecticut Fire Insurance Co.	35,854 16	5,827 46	6,106 42
Continental Insurance Co.	35,063 68	4,986 64	4,970 14
Detroit Fire & Marine Insurance Co.	7,082 14	696 48	984 48
Dominion Fire Insurance Co.	7,535 34	2,452 21	2,452 21
Dominion of Canada Guarantee & Accident Insurance Co.	1,243 90	*Nil.*	6 00
Eagle Star & British Dominions Insurance Co., Ltd.	16,689 69	471 09	471 09
Employers Liability Assurance Co., Ltd.	50,697 32	874 21	1,281 73
Equitable Fire & Marine Insurance Co.	6,766 48	1,077 99	1,010 82
Fidelity Phenix Fire Insurance Co.	44,720 40	9,146 21	9,548 63
Fire Association of Philadelphia	25,252 32	3,050 00	3,492 15
Fireman's Fund Insurance Co.	40,260 33	9,290 33	8,578 67
Firemen's Insurance Co. of Newark	14,129 14	613 79	981 14
General Accident Fire & Life Assurance Corporation	26,501 91	308 52	273 52
General Fire Assurance Co.	16,459 48	983 00	1,934 95
Great American Insurance Co.	35,030 00	2,449 12	4,322 12
Glens Falls Insurance Co.	35,668 28	14,155 18	14,312 59
Globe & Rutgers Fire Insurance Co.	36,404 96	6,334 78	2,933 60
Globe Indemnity Co. of Canada	538 38	*Nil.*	*Nil.*
Guardian Assurance Co., Ltd.	95,248 55	17,875 81	28,400 83
Guardian Fire Insurance Co.	7,938 59	.....	1,368 51
Hartford Fire Insurance Co.	96,904 61	14,316 97	11,721 54
Home Insurance Co.	71,587 31	16,497 48	11,202 98
Hudson Bay Insurance Co.	40,896 46	8,645 32	9,415 32
Imperial Guarantee & Accident Insurance Co.	1,825 95	1,306 53	1,225 78
Imperial Underwriters Corporation of Canada	43,642 86	1,226 61	2,385 87
Industrial Fire Insurance Co.	11,040 58	1,719 57	4,984 20
Insurance Co. of North America	68,726 19	18,151 08	18,648 91
Insurance Co. of State of Pennsylvania	21,951 53	18,355 81	19,563 58
Law, Union & Rock Insurance Co., Ltd.	14,276 88	1,594 48	1,648 03
Liverpool & London & Globe Insurance Co., Ltd.	164,577 29	27,273 69	33,122 53
Liverpool-Manitoba Assurance Co.	39,975 72	12,452 20	13,767 35
London Assurance Corporation	65,692 97	8,467 52	10,555 77
London & Lancashire Fire Insurance Co., Ltd.	90,215 29	27,730 32	23,134 32
London Guarantee & Accident Co., Ltd.	12,423 62	3,562 04	3,480 99
London Mutual Fire Insurance Co. of Canada	40,404 32	11,877 01	11,908 01
Marine Insurance Co., Ltd.	3,065 77	1,408 42	1,335 92
Mechanics & Traders Insurance Co.	14,684 24	1,414 07	1,518 09
Mercantile Fire Insurance Co.	26,436 04	7,119 44	7,105 44
Merchants Fire Assurance Corporation	8,448 48	1,680 00	1,517 03
Michigan Fire & Marine Insurance Co.	3,521 45	66 43	766 05
Millers National Insurance Co.	4,540 95	3,551 49	3,531 49
Minneapolis Fire & Marine Insurance Co.	4,516 69	1,410 89	1,580 58
Mount Royal Assurance Co.	43,248 51	14,541 80	15,287 80
National Benefit Life and Property Assurance Co., Ltd.	254 23	739 95	739 95
National Ben Franklin Fire Insurance Co.	12,367 71	5,533 14	5,534 77
National Fire Insurance Co. of Hartford	67,349 22	9,005 48	22,396 68
Nationale Fire Insurance Co. of Paris	21,816 25	8,431 74	7,843 74
National Union Fire Insurance Co.	19,973 66	5,401 35	3,434 65
Newark Fire Insurance Co.	13,588 30	461 47	2,438 59
New Jersey Fire Insurance Co.	16,172 68	1,777 19	1,781 19
Niagara Fire Insurance Co.	33,989 35	5,187 32	5,417 32
Northern Assurance Co., Ltd.	77,093 61	13,618 00	15,888 00
North British & Mercantile Insurance Co.	59,840 37	14,713 63	15,978 78
North Empire Fire Insurance Co.	11,171 33	6,911 79	6,911 79
North West Fire Insurance Co.	8,891 72	3,742 66	3,742 66
Northwestern Mutual Fire Association	8,722 46	*Nil.*	*Nil.*
Northwestern National Insurance Co.	15,727 54	1,278 78	1,280 08
Norwich Union Fire Insurance Society, Ltd.	64,083 78	12,889 91	15,834 11
Ocean Accident & Guarantee Corporation, Ltd.	11,298 99	8,006 54	7,716 54
Occidental Fire Insurance Co.	10,916 09	11 42	1,206 05
Pacific Coast Fire Insurance Co.	26,748 30	2,767 76	2,424 64
Pacific Fire Insurance Co.	13,631 07	8,248 57	9,796 93
Carried forward.	$2,505,356 36	$582,966 62	$615,985 32

FIRE INSURANCE PREMIUMS AND LOSSES—*Concluded.*

Name of Company.	Net Premiums.	Net Amount of Losses incurred.	Net Amount of Losses paid.
Brought forward	$2,505,356 36	$582,966 62	$615,985 32
Pacific States Fire Insurance Co	2,700 86	23 31	62 51
Palatine Insurance Co., Ltd	32,088 07	9,456 06	8,811 88
Phenix Fire Insurance Co	11,528 95	3,576 48	3,989 37
Phoenix Assurance Co., Ltd	254,359 74	79,693 10	102,899 36
Phoenix Insurance Co	62,272 40	10,339 61	10,700 65
Providence Washington Insurance Co	19,378 41	8,604 55	8,877 81
Provincial Insurance Co., Ltd	5,220 06	9,184 19	9,184 19
Quebec Fire Assurance Co	15,889 85	13,171 73	13,171 73
Queen Insurance Co. of America	74,940 00	18,943 81	23,943 81
Reliance Insurance Co. of Philadelphia	14,072 54	1,634 85	1,669 85
Rhode Island Insurance Co	6,369 38	1,486 01	1,412 62
Royal Exchange Assurance	56,735 03	5,545 18	4,808 18
Royal Insurance Co., Ltd	110,609 59	29,878 52	38,258 52
St. Paul Fire & Marine Insurance Co	19,517 95	3,747 75	3,780 65
Scottish Union & National Insurance Co	54,417 69	19,042 43	20,556 43
Springfield Fire & Marine Insurance Co	47,363 07	11,034 97	8,894 53
Stuyvesant Insurance Co	18,892 38	18,462 39	19,205 41
Sun Insurance Office	61,069 54	8,078 63	8,156 63
Svea Fire & Life Insurance Co., Ltd	20,194 46	3,530 67	3,393 73
Union Assurance Society, Ltd	47,669 50	10,073 92	10,073 92
Union Fire Insurance Co	21,940 02	5,424 77	5,632 19
Union Insurance Society of Canton, Ltd	18,158 42	*Nil.*	*Nil.*
Vulcan Fire Insurance Co. of Oakland, Cal.	7,415 28	775 56	775 96
Western Assurance Co.	62,482 92	18,058 60	15,653 15
Westchester Fire Insurance Co	32,642 89	9,255 91	12,856 60
Yorkshire Insurance Co., Ltd	25,657 29	5,649 39	5,705 60
Total	$3,609,442 65	$887,639 01	$958,460 60

SUMMARY.

Year.	Net Premiums.	Net Amount of Losses incurred.	Net Amount of Losses paid.
1912	$ 3,535,653 32	$ 1,084,890 57	$ 1,065,489 36
1913	3,790,094 12	1,149,144 94*	1,043,254 41
1914	3,592,878 30	1,696,780 49	1,542,845 20
1915	3,180,168 66	1,176,835 11	1,313,759 23
1916	3,121,885 87	1,378,764 79	1,290,641 50
1917	3,609,442 65	887,639 01	958,460 60
Totals	$20,840,122 92	$7,374,054 81	$7,214,450 30

*Approximate.

INVESTMENTS IN BRITISH COLUMBIA OF COMPANIES OTHER THAN LIFE INSURANCE COMPANIES.

(For British Columbia investments of Life Insurance Companies *see* Abstract of Returns of Life Insurance Companies, *post.*)

Name of Company.	Mortgages.	In other Securities.
American Central Insurance Co		$ 30,660 00*
Boiler Inspection & Insurance Co		44,000 00*
Boston Insurance Co		25,000 00*
British America Assurance Co		160,866 66*
British Columbia Plate Glass Insurance Co		5,973 33*
British Crown Assurance Corporation, Ltd		25,219 86*
British Northwestern Fire Insurance Co	$ 8,770 04	
Caledonian Insurance Co	1,230,638 85	47,956 96
California Insurance Co		21,950 00†
Canada Accident Assurance Co		19,000 00*
Canada National Fire Insurance Co	98,844 61	
Canadian Surety Co		25,733 33*
Century Insurance Co., Ltd		26,000 00*
Commercial Union Assurance Co., Ltd	20,444 67	
Dominion Fire Insurance Co	13,000 00	35,353 33*
Dominion of Canada Guarantee & Accident Insurance Co		83,911 50*
General Accident Insurance Co		33,557 61*
General Accident Fire & Life Insurance Co		47,343 21
Glens Falls Insurance Co		20,000 00*
Globe & Rutgers Fire Insurance Co		48,180 00*
Globe Indemnity Co		5,000 00*
Guardian Assurance Co., Ltd		56,590 00‡
Guardian Insurance Co. of Canada		39,767 36†
Hartford Fire Insurance Co		50,000 00
Home Insurance Co		50,000 00*
Hudson Bay Insurance Co	40,760 49	108,153 30*
Imperial Guarantee & Accident Insurance Co. of Canada		29,676 50†
Imperial Underwriters Corporation	103,298 00	30,434 75†
Insurance Co. of State of Pennsylvania		53,200 00*
Law, Union & Rock Insurance Co., Ltd	380,000 00	
Liverpool-Manitoba Assurance Co		30,000 00*
London Assurance Corporation		226,000 00*
London & Lancashire Guarantee & Accident Insurance Co		447 80‡
London Guarantee & Accident Co., Ltd		345,533 33*
London Mutual Fire Insurance Co	537 50	25,975 00‡
Loyal Protective Insurance Co		3,720 00‡
Maryland Casualty Co		31,769 60‡
National Ben Franklin Fire Insurance Co		39,997 12†
National Fire Insurance Co. of Hartford		22,984 73†
National Plate Glass Insurance Co		5,510 00
National Union Fire Insurance Co		35,000 00*
North American Accident Insurance Co		15,437 00†
North British & Mercantile Insurance Co	618,500 00	149,600 00*
North Empire Fire Insurance Co		45,000 00*
Northern Assurance Co		250,000 00
Northwestern National Insurance Co		54,506 67*
Norwich Union Fire Insurance Society, Ltd		75,200 00*
Pacific Coast Fire Insurance Co	246,466 85	346,966 18†
Queen Insurance Co. of America		52,000 00*
Royal Insurance Co., Ltd	319,784 00	194,066 67*
Royal Plate Glass Insurance Co. of Canada	2,250 00	
Springfield Fire & Marine Insurance Co		45,000 00*
Travelers Indemnity Co		25,000 00*
United States Fidelity & Guaranty Co		4,500 00‡
Totals	$3,083,295 01	$3,146,841 80

* Par value. † Book value. ‡ Market value.

FIRE STATISTICS, 1917.

I. FIRES REPORTED.

Districts reporting.	Number.	Amount of Loss.
City Municipalities (35).		
Alberni		
Armstrong		
Chilliwack	4	$ 2,227
Courtenay		
Cranbrook	5	595
Cumberland	1	100
Duncan	1	8,400
Enderby	1	200
Fernie	11	18,234
Grand Forks	2	11,600
Greenwood	1	140
Kamloops	8	5,588
Kaslo	2	2,000
Kelowna	6	455
Ladysmith		
Merritt	4	5,922
Nanaimo	14	1,274
Nelson	9	12,152
New Westminster	12	5,498
North Vancouver	11	8,124
Phoenix	7	11,724
Port Alberni		
Port Coquitlam	3	5,625
Port Moody	5	1,311
Prince George	6	4,665
Prince Rupert	8	24,215
Revelstoke	5	5,248
Rossland	12	18,808
Salmon Arm	2	9,460
Sandon	2	1,000
Slocan		
Trail	13	23,305
Vancouver	181	425,992
Vernon	9	1,063
Victoria	77	141,502
Totals	422	$756,427
District Municipalities (28).		
Burnaby	15	$ 19,780
Chilliwack	6	8,975
Coldstream		
Coquitlam	3	11,055
Delta	2	1,500
Esquimalt	6	37,555
Fraser Mills		
Kent	1	3,500
Langley	2	6,463
Maple Ridge	1	3,350
Matsqui	4	9,269
Mission	1	1,200
North Cowichan	7	52,360
North Vancouver	3	2,125
Oak Bay	5	2,283
Peachland	1	1,000
Penticton	5	4,431
Pitt Meadows	1	250
Point Grey	5	3,152
Richmond	12	15,935
Saanich	11	24,195
Salmon Arm		
South Vancouver	29	18,384
Spallumcheen		
Sumas		
Summerland		
Surrey		
West Vancouver	3	680
Totals	123	$227,442
Insurance Districts (14).		
Boundary	14	$ 25,080
Fort St. John		
Fort George and Tete Jaune	6	18,625
Hazelton	10	13,087
Kamloops	4	12,200
Kootenay, North-east	10	38,576
Kootenay, South-east	18	189,519
Carried forward	62	$ 297,087

I. FIRES REPORTED—*Concluded.*

Districts reporting.	Number.	Amount of Loss.
Insurance Districts.—Concluded.		
Brought forward	62	$ 297,087
Kootenay, West	14	60,648
Lillooet	7	29,735
Nanaimo-West Coast	8	36,500
Skeena-Atlin	1	2,250
Vernon	1	300
Vancouver-New Westminster	17	93,221
Yale	7	38,268
Totals	117	$558,009
Grand totals	662	$1,541,878

NOTE.—Construction of buildings—

Fire-resisting	4, loss	$ 277,210
Brick	47, "	98,871
Frame	611, "	1,165,797
Total	662	$1,541,878

II. CAUSES OF FIRES.

Causes of Fires.	Number.	Amount of Loss.
Ashes against wood	18	$ 23,509
Boiler insufficiently protected	1	100
Bottom of pan containing oil falling out on stove	1	200
Box too near stove	1	15
Candle carelessness	5	1,458
Carburettor back-firing	7	1,395
Children playing with fire in stove	1	10
Clothes too near stove	4	2,915
Coal-gas explosion	1	438
Coal-oil explosion	1	25
Curtain against stove	1	28
Defective chimney	53	60,202
Defective chimney-stopper	1	5
Defective fireplace	13	2,815
Defective furnace or furnace-pipes	5	115
Defective oven	1	3,200
Defective stove or stove-pipes	13	9,866
Defective wiring	15	28,687
Drying wood in oven	1	346
Electrical appliances	5	4,400
Exposure	51	120,468
Firewood too near stove	3	965
Foul chimney	2	555
Forest fires	3	*16,100
Fumigation	1	20
Furnace insufficiently protected	2	1,099
Furnace overheated	3	9,545
Furnace-pipe insufficiently protected	5	257
Gas explosion	2	225
Gasolene carelessness	3	900
Gasolene explosion	2	50,750
Gasolene-torch exploding	1	152
Grease on stove or range	5	757
Hot bearing	3	126,727
Incendiary	18	39,738
Lamp carelessness	1	90
Lamp explosion	5	3,643
Lamp upset	4	19,425
Lantern upset	1	10
Lighting fire with gasolene	1	5
Live coals from stove	2	970
Match carelessness	14	9,789
Matches, children with	17	3,288
Matches, igniting from lantern	1	121
Matches, mice with	1	2,300
Mattress too near stove	1	120
Motor-journal overheated	1	25
Nail in picking-machine	2	5,499
Oil-stove explosion	2	1,965
Oil-stove insufficiently protected	1	35
Oil-stove upset	2	3,145
Overheated resistance-coil	1	5
Paper dropped on stove by children	1	3,700
Rubbish against stove	1	2
Rubbish in boiler-room	1	536
Sack on fire thrown on verandah	1	3
Short circuit	6	292
Smokers' carelessness	21	13,642
Smoke-stack insufficiently protected	1	15
Smudge for mosquitoes	1	800
Sparks from asphalt heater	1	5
Sparks from chimney	102	45,802
Sparks from feed-cooker	1	975
Sparks from fire under boiler	1	1,400
Sparks from fireplace	4	7,561
Sparks from furnace	1	5,000
Sparks from locomotive	4	1,692
Sparks from mill burner	6	17,270
Sparks from pile-driver engine	1	10
Sparks from smoke-stack	7	13,450
Sparks from stove-pipe chimney	1	2,300
Sparks from stove	6	5,414
Sparks from threshing-machine	1	1,775
Spontaneous combustion	10	6,713
Stove explosion	1	50
Stove insufficiently protected	28	32,305
Stove-pipe insufficiently protected	9	13,928
Stove-pipe chimney	6	11,467
Sweeping dust off boiler while furnace doors open	1	1,136
Tar boiling over on stove	1	30
Thawing pipes	4	5,706
Thawing powder	1	15
Tramps	1	2,550
Unknown	122	788,552
Total	662	$1,541,878

III. CLASSIFICATION OF PROPERTY BURNED AND CAUSES.

Property.		Causes.		Amount of Loss.	
Apartment-houses	8	Defective wiring	1	$ 110	
		Electrical appliances	1	225	
		Gas explosion	1	75	
		Grease on range	1	5	
		Matches, children with	1	115	
		Oil-stove insufficiently protected	1	35	
		Sparks from chimney	2	1,405	
					$1,970
Assay offices	1	Thawing pipes	1	....	5
Automobiles	9	Carburettor back-firing	4	$ 1,285	
		Match carelessness	1	70	
		Short circuit	3	230	
		Unknown	1	458	
					2,043
Bakeries	1	Defective oven	1	.....	3,200
Banks	2	Candle carelessness	1	$ 50	
		Smokers' carelessness	1	7	
					57
Barber-shops	1	Unknown	1	.....	573
Barns	20	Ashes against wood	1	$ 3	
		Forest fires	2	1,100	
		Incendiary	1	750	
		Lamp explosion	1	275	
		Match carelessness	1	5	
		Matches, children with	2	157	
		Smokers' carelessness	1	175	
		Spark from feed-cooker	1	975	
		Spark from fire under boiler	1	1,400	
		Spark from locomotive	1	700	
		Spark from threshing-machine	1	1,775	
		Unknown	7	3,935	
					11,250
Barracks	1	Grease on range	1	....	175
Blacksmith-shops	1	Spontaneous combustion	1	.....	1,100
Boarding-houses	1	Defective chimney	1	.....	80
Boats	6	Carburettor back-firing	1	$ 75	
		Gasolene explosion	1	750	
		Match carelessness	1	5	
		Spontaneous combustion	2	1,450	
		Unknown	1	200	
					2,480
Boat-houses	1	Match carelessness	1	.....	1,045
Boiler-houses	1	Sweeping dust off boilers while furnace doors open	1	.....	1,136
Cannery	1	Defective chimney	1	.....	100
Carpenter-shop	1	Exposure	1	.....	75
Carpet-cleaning plant	1	Unknown	1	.....	207
Chicken-houses	8	Candle carelessness	1	$ 25	
		Defective stove-pipes	2	325	
		Lamp explosion	1	43	
		Match carelessness	2	110	
		Matches, children with	1	75	
		Unknown	1	65	
					643
Churches	2	Furnace overheated	1	$ 460	
		Incendiary	1	100	
					560
College buildings	1	Defective chimney	1	.....	565
Concentrator	1	Unknown	1	.....	105,000
Creameries	1	Defective chimney	1	.....	30
Dry-kilns	3	Sparks from mill burner	1	$ 115	
		Sparks from smoke-stack	2	8,903	
					9,018
Dwellings	371	Ashes against wood	7	$ 224	
		Candle carelessness	1	80	
		Children playing with fire in stove	1	10	
		Clothes too near stove	4	2,915	
		Curtain against stove	1	28	
		Defective chimney	38	46,227	
		Defective fireplace	10	2,480	
		Defective furnace or furnace-pipes	4	50	
		Defective stove or stove-pipes	11	9,541	
		Defective wiring	6	2,554	
Carried forward	443		155	$64,109	$141,312

III. CLASSIFICATION OF PROPERTY BURNED AND CAUSES—*Continued.*

Property.		Causes.		Amount of Loss.	
Brought forward	443		155	$ 64,109	$141,312
Dwellings—*Concluded*		Drying wood in oven	1	346	
		Electrical appliances	3	75	
		Exposure	27	15,949	
		Firewood too near stove	3	965	
		Foul chimney	1	5	
		Furnace-pipe insufficiently protected	4	222	
		Furnace overheated	1	85	
		Incendiary	10	10,103	
		Lamp explosion	3	3,325	
		Lamp upset	3	2,425	
		Lighting fire with gasolene	1	5	
		Live coals from stove or chimney clean-out	2	970	
		Match carelessness	3	1,023	
		Matches, children with	12	2,936	
		Matches igniting from lantern	1	121	
		Oil-stove explosion	2	1,865	
		Oil-stove upset	1	3,000	
		Paper dropped on stove by children	1	3,700	
		Sack on fire thrown on verandah	1	3	
		Smokers' carelessness	5	1,235	
		Smudge for mosquitoes	1	800	
		Sparks from asphalt heater	1	5	
		Sparks from chimney	92	34,748	
		Sparks from fireplace	4	7,561	
		Sparks from mill burner	2	140	
		Sparks from smoke-stack	2	127	
		Sparks from stove	3	2,000	
		Spontaneous combustion	4	278	
		Stove explosion	1	50	
		Stove insufficiently protected	19	24,081	
		Stove-pipe insufficiently protected	8	5,653	
		Stove-pipe chimney	5	11,407	
		Tar boiling over on stove	1	30	
		Thawing pipes	1	15	
		Unknown	59	146,633	
					345,995
Dyers and cleaners	1	Gasolene carelessness	1		200
Factories (mattress)	2	Spark caused by nail in picking-machine	2		5,499
Factories (sash and door)	1	Spontaneous combustion	1		1,330
Factories (soap)	1	Defective fireplace	1		20
Factories (soda-water)	1	Spark from smoke-stack	1		5
Factories (wood-workers)	2	Hot bearing	1	$120,794	
		Unknown	1	4,048	
					124,842
Fair buildings	1	Match carelessness	1		225
Fish-curing plants	1	Defective chimney	1		1,325
Garages	6	Gas explosion	1	$ 150	
		Gasolene explosion	1	50,000	
		Lamp carelessness	1	90	
		Lantern upset	1	10	
		Match carelessness	1	20	
		Unknown	1	275	
					50,545
Halls	1	Unknown	1		2,100
Hospitals	3	Defective fireplace	1	$ 300	
		Sparks from chimney	1	8,400	
		Stove-pipe chimney	1	60	
					8,760
Hotels	28	Ashes against wood	1	$ 10	
		Defective chimney	4	9,596	
		Exposure	1	14,000	
		Gasolene carelessness	1	20	
		Smokers' carelessness	6	437	
		Sparks from chimney	2	358	
		Stove insufficiently protected	2	1,237	
		Thawing pipes	1	1,186	
		Tramps	1	2,550	
		Unknown	9	66,705	
					96,099
Hotels and stores	2	Defective chimney	1	$ 100	
		Exposure	1	20,000	
					20,100
Ice-cream parlours	1	Unknown	1		700
Iron-works	1	Spark from chimney	1		50
Carried forward	495		495		$799,107

III. CLASSIFICATION OF PROPERTY BURNED AND CAUSES—*Continued.*

Property.		Causes.		Amount of Loss.	
Brought forward	495		495		$799,107
Launch	2	Smokers' carelessness	1	60	
		Unknown	1	200	
					260
Laundries	4	Boiler insufficiently protected	1	$ 100	
		Defective wiring	1	20,000	
		Incendiary	1	4,900	
		Stove insufficiently protected	1	500	
					25,500
Lodge-rooms	1	Spark from chimney	1		20
Lumber-yards	2	Spark from locomotive	1	$ 40	
		Spark from mill burner	1	15,000	
					15,040
Machine-shops	2	Ashes against wood	1	$ 21,875	
		Hot bearing	1	570	
					22,445
Mess-houses	1	Unknown	1		2,000
Mills	1	Spark from mill burner	1		15
Mine property	1	Incendiary	1		400
Motor-cycles	3	Carburettor back-firing	2	$ 35	
		Gasolene carelessness	1	30	
					65
Motor-trucks	1	Unknown	1		100
Municipal halls	1	Unknown	1		1,000
Offices	6	Rubbish in boiler-room	1	$ 536	
		Coal-oil explosion	1	25	
		Exposure	1	1,500	
		Unknown	3	19,225	
					21,286
Offices and dwellings	1	Lamp upset	1		17,000
Planing-mills	1	Incendiary	1		3,650
Pool-rooms	1	Spark from chimney	1		10
Printing-offices	1	Exposure	1		2,000
Public halls	1	Exposure	1		800
Pump-houses	1	Unknown	1		125
Railway-stations	1	Unknown	1		3,500
Restaurants	4	Grease on range	2	$ 557	
		Incendiary	1	10	
		Mattress too near stove	1	120	
					687
Restaurants and rooms	1	Furnace-pipe insufficiently protected	1		10
Rooming-houses	5	Defective chimney	1	$ 165	
		Defective wiring	1	2,800	
		Exposure	1	100	
		Sparks from stove	1	100	
		Stove insufficiently protected	1	3,500	
					6,665
Sawmills	5	Forest fire	1	$ 15,000	
		Motor-journal overheated	1	25	
		Spark from furnace	1	5,000	
		Spark from mill burner	1	2,000	
		Spark from smoke-stack	1	4,400	
					26,425
Schools	6	Defective chimney	1	$ 1,076	
		Furnace overheated	1	9,000	
		Incendiary	1	20,000	
		Stove insufficiently protected	1	50	
		Unknown	2	23,800	
					53,926
Sheds	17	Ashes against wood	5	$ 85	
		Candle carelessness	1	3	
		Exposure	1	245	
		Matches, children with	1	5	
		Smokers' carelessness	2	35	
		Spark from locomotives	2	952	
		Spark from pile-driver engine	1	10	
		Stove insufficiently protected	1	550	
		Thawing powder	1	15	
		Unknown	2	1,125	
					3,025
Carried forward	565		565		$1,005,061

III. CLASSIFICATION OF PROPERTY BURNED AND CAUSES—*Concluded.*

Property.		Causes.		Amount of Loss.	
Brought forward	565		565		$1,005,061
Sheet-metal works	1	Furnace insufficiently protected	1		1,074
Shingle-mills	6	Defective wiring	1	1,100	
		Hot bearing	1	5,363	
		Spark from smoke-stack	1	15	
		Smoke stack insufficiently protected	1	15	
		Unknown	2	36,500	
					42,993
Stables	2	Unknown	2		250
Stores	37	Ashes against wood	2	$ 1,307	
		Rubbish too close to stove	1	2	
		Defective chimney	2	38	
		Defective chimney-stopper	1	5	
		Defective furnace	1	65	
		Defective wiring	3	1,661	
		Exposure	10	39,189	
		Foul chimney	1	550	
		Grease igniting on stove	1	20	
		Incendiary	1	475	
		Match carelessness	2	4,786	
		Oil-stove upset	1	145	
		Smokers' carelessness	2	1,896	
		Sparks from chimney	1	800	
		Sparks from stove	1	3,234	
		Spontaneous combustion	1	40	
		Unknown	7	33,812	
					88,025
Stores and dwellings over	28	Bottom of pan containing oil dropping out on stove	1	$ 200	
		Candle carelessness	1	1,300	
		Defective chimney	1	900	
		Defective fireplace	1	15	
		Defective wiring	1	450	
		Electrical appliances	1	4,100	
		Exposure	4	23,600	
		Fumigation	1	20	
		Match carelessness	1	2,500	
		Matches, mice with	1	2,300	
		Smokers' carelessness	1	1,036	
		Spark from chimney	1	11	
		Spark from stove-pipe chimney	1	2,300	
		Spontaneous combustion	1	1,975	
		Stove insufficiently protected	3	2,387	
		Stove-pipe insufficiently protected	1	8,275	
		Unknown	7	36,074	
					87,443
Stores and offices over	5	Gasolene-torch exploding	1	$ 152	
		Smokers' carelessness	2	8,736	
		Unknown	2	25,510	
					34,398
Stores and rooms over	4	Box too near stove	1	$ 15	
		Coal-gas explosion	1	438	
		Furnace-pipe insufficiently protected	1	50	
		Smokers' carelessness	1	25	
					528
Street-cars	5	Defective wiring	1	$ 12	
		Overheated resistance-coil	1	5	
		Short circuit	3	65	
					79
Tents	1	Spark from stove	1		80
Theatres (moving-picture)	2	Exposure	1	$ 3,000	
		Thawing pipes	1	4,500	
Warehouses	6				7,500
		Ashes against wood	1	$ 5	
		Exposure	1	10	
		Unknown	4	274,432	
					274,447
Totals	662		662		$1,541,878

IV. Summary.

	Fires reported.				Amount of Loss.			
	Cities (35).	Other Municipalities (28).	Insurance Districts (14).	Total (77).	Cities.	Other Municipalities.	Insurance Districts.	Total.
1917.								
January	38	6	11	55	$ 320,223	$ 5,889	$ 28,461	$ 354,573
February	23	11	16	50	11,760	8,889	146,581	167,240
March	42	12	14	68	76,695	27,995	56,060	160,750
April	30	10	6	46	40,753	16,741	7,495	64,989
May	41	11	13	65	34,147	18,283	41,540	93,970
June	34	13	4	51	149,543	16,092	12,480	178,115
July	39	17	20	76	17,702	22,279	109,928	149,909
August	60	17	11	88	39,448	20,707	56,900	117,065
September	27	9	11	47	8,756	67,431	56,849	133,036
October	39	10	5	54	36,259	10,896	12,175	59,330
November	19	3	2	24	14,370	2,970	2,750	20,090
December	30	4	4	38	6,761	9,270	26,790	42,821
Totals, 1917	422	123	117	662	$ 756,427	$227,442	$558,009	$1,541,878
Totals, 1916	496	172	.....	668	1,041,440	339,512	.....	1,380,952
Totals, 1915	469	240	.....	709	865,093	365,717	.....	1,230,810
Totals, 1914	535	223	.....	758	1,249,723	390,111	.....	1,639,834
Grand totals.	1,922	758	117	2,797	$3,912,683	$1,322,782	$558,009	$5,793,474

V. Loss of Life, 1916-17.

Occupancy.	Cause of Fire.	Loss of Life.	
		Adults.	Children.
Dwelling	Defective stove-pipe	.....	1
Hotel	Unknown	8	.....
Totals		8	1
Totals, 1916		6	9

LIST OF COMPANIES LICENSED UNDER THE "INSURANCE ACT," DECEMBER 31ST, 1917.

Name of Company and Head Office.	Attorney to receive Process in British Columbia. (Corrected to July 8th, 1918.)	Description of Insurance Business for which Licensed (Corrected to July 8th, 1918.)	Deposits of Companies other than Dominion Licensees. (Par values.)
Ætna Insurance Co., Hartford, Conn	J. E. Kinsman, Victoria	Automobile and marine.*	
Alliance Assurance Co., Ltd., London, Eng.	W. Anderson and H. Miskin, Vancouver	Marine, accident, sickness, guarantee and automobile.*	
The Boiler Inspection & Insurance Co. of Canada, Toronto, Ont.	R. V. Winch & Co., Ltd., Vancouver	Steam-boiler.	
Boston Insurance Co., Boston, Mass.	A. Z. DeLong, Vancouver	Marine.*	
The British and Foreign Marine Insurance Co., Ltd., Liverpool, Eng.	B. C. Mess, Victoria	Marine, inland transportation, sprinkler leakage.	
The British Columbia Plate Glass Insurance Co., Vancouver, B.C.	Head Office, Vancouver	Plate glass	War Loan Bonds, $1,000; Municipal Securities, $5,000; B.C. Inscribed Stock, $973.32.
British Columbia Life Assurance Co., Vancouver, B.C.	L. W. Shatford, Vancouver	Life.	
British Crown Assurance Corporation, Ltd., Glasgow, Scotland	A. S. Matthew, Vancouver	Automobile (excluding insurance against loss by reason of bodily injury to the person).	
The Canada Accident Assurance Co., Montreal, Que.	John Hart, Victoria	Accident, sickness, plate glass, and guarantee.*	
Canada Life Assurance Co., Toronto, Ont.	F. W. Marsh, Vancouver	Life.	
The Canadian Surety Co., Toronto, Ont.	William Savage, Vancouver	Guarantee, burglary, plate glass, and automobile.	
The Canton Insurance Office, Limited, Victoria, Hong Kong	Wm. Monteith & Co., Ltd., Victoria	Marine.	
The Capital Life Assurance Co. of Canada, Ottawa, Ont.	W. D. Kennedy, Vancouver	Life.	
Confederation Life Association, Toronto, Ont.	J. L. Kerr, Vancouver	Life.	
The Continental Life Insurance Co., Toronto, Ont.	N. B. Bailey, Vancouver	Life.	
The Crown Life Insurance Co., Toronto, Ont	F. R. McD. Russell, Vancouver	Life.	
The Dominion of Canada Guarantee & Accident Ins. Co., Toronto, O.	H. W. Falconer, Vancouver	Accident, guarantee, sickness, burglary, and plate glass.*	
Dominion Gresham Guarantee & Casualty Co., Montreal, Que.	H. T. Devine, Vancouver	Accident, sickness, guarantee, burglary, and automobile.	
The Dominion Life Assurance Co., Waterloo, Ont.	F. W. Parkin, Vancouver	Life.	
The Eagle & British Dominions Insurance Co., Ltd., London, Eng.	R. J. Loewen & R. G. Harvey, Vancouver	Marine.*	
Employers Liability Assurance Corporation, Ltd., London, Eng	D. C. McGregor, Vancouver	Accident, sickness, guarantee, automobile, burglary, steam-boiler, and plate glass.*	
The Equitable Life Assurance Society of U.S., New York, N.Y.	J. H. Campbell, Vancouver	Life.	
The Excelsior Life Insurance Co., Toronto, Ont.	F. J. Gillespie, Vancouver	Life.	
The Fidelity & Casualty Co., New York, N.Y.	Seeley & Co., Vancouver	Accident, sickness, burglary, steam-boiler, and plate glass.	
Fireman's Fund Insurance Co., San Francisco, Cal.	John Hart, Victoria	Marine, inland transportation, and insurance against loss or damage to automobiles by accident, burglary, or theft.*	
General Accident Assurance Co. of Canada, Toronto, Ont.	G. E. Rodwell, Vancouver	Accident, sickness, steam-boiler, and guarantee.	
General Animals Insurance Co. of Canada, Montreal, Que.	R. W. Douglas, Vancouver	Live stock.	
Globe Indemnity Co. of Canada, Montreal, Que.	F. W. Rounsefell, Vancouver	Accident, sickness, burglary, automobile, and guarantee.*	
The Great West Life Assurance Co., Winnipeg, Man.	J. A. Johnson, Vancouver	Life.	
Gresham Life Assurance Society, Ltd., London, Eng.	H. E. Boorman, Vancouver	Life.	
The Guarantee Company of North America, Montreal, Que.	C. A. Holland, Victoria	Guarantee.	
Guardian Insurance Co. of Canada, Montreal, Que.	W. E. Graveley, Vancouver	Accident, sickness, guarantee, plate glass, burglary, and automobile.	
†Guardian Casualty & Guaranty Co., Salt Lake City, Utah	A. S. Matthew, Vancouver	Accident, sickness, and guarantee.	Deposit receipt, Union Bank of Canada, $25,000.
Home Insurance Co., New York, N.Y.	R. Kerr Houlgate, Vancouver	Automobile, sprinkler leakage, hail, tornado, and explosion.*	
Imperial Guarantee & Accident Insurance Co. of Canada, Toronto, O.	D. Cramer, Vancouver	Guarantee, accident, sickness, automobile, and plate glass. (Also licensed under "B.C. Fire Insurance Act" to transact the business of insurance of automobiles against fire.)	
Imperial Life Assurance Co. of Canada, Toronto, Ont.	Stanley Henderson, Vancouver	Life.	
Insurance Company of North America, Philadelphia, Pa.	Edward Odlum, Vancouver	Inland transportation, automobile (excluding injury to the person), and marine.*	
Law, Union & Rock Insurance Co., Ltd., London, Eng.	R. S. Day, Victoria	Accident and sickness.*	
Lloyds Plate Glass Insurance Co., New York, N.Y.	C. A. MacMorran, Vancouver	Plate glass.	
London Assurance Corporation, London, Eng.	R. V. Winch & Co., Ltd., Victoria	Marine.*	

London Guarantee & Accident Co., Ltd., London, Eng	J. H. Watson, Vancouver	Accident, sickness, guarantee, and burglary.*	
The London Life Insurance Co., London Ont	William B. Ryan, Victoria	Life.	
The London & Lancashire Guarantee & Accident Co. of Canada, Toronto, Ont.	Wm. Thompson, Vancouver	Accident, sickness, guarantee, plate glass, and automobile.	
The London & Lancashire Life & General Assurance Association, Ltd., London, Eng.	H. J. Woodley, Vancouver	Life.	
London & Provincial Marine & General Insurance Co., Ltd., London, E.	R. V. Winch & Co., Ltd., Victoria	Marine.	
Loyal Protective Insurance Co., Boston, Mass	G. H. Grant, Vancouver	Accident and sickness amongst members of I.O.O.F.	
The Manufacturers Life Insurance Co., Toronto, Ont	W. B. Barwis, Vancouver	Life.	
The Marine Insurance Co., Ltd., London, Eng	W. W. Johnston, Vancouver	Inland transportation and automobile. (Also licensed under "B.C. Fire Insurance Act" to insure automobiles against loss or damage by fire.)	
Maritime Insurance Co., Ltd., Liverpool, Eng	R. P. Rithet & Co., Ltd., Victoria	Marine.	
Maryland Casualty Co., Baltimore, Maryland	J. H. Lawson, Victoria	Accident, sickness, burglary, guarantee, plate glass, and steam-boiler.	
Merchants Casualty Co., Winnipeg, Man	J. B. Love, Vancouver	Accident (excluding employers' liability) and sickness.	
Metropolitan Life Insurance Co., New York, N.Y	Wm. Murphy, Victoria	Life.	
The Monarch Life Assurance Co., Winnipeg, Man	R. W. Harris, Vancouver	Life.	
Mutual Life Assurance Co. of Canada, Waterloo, Ont	W. J. Twiss, Vancouver	Life.	
The Mutual Life Insurance Co. of New York, N.Y	A. Callander, Vancouver	Life.	
National Life Assurance Co. of Canada, Toronto, Ont	Lindley Crease, Victoria	Life.	
The National Plate Glass Insurance Co., Ltd., Winnipeg, Man	Waghorn, Gwynn & Co., Ltd., Vancouver	Plate glass	Municipal Securities, $5,510.
National Provincial Plate Glass & General Insurance Co., Ltd., London, Eng.	F. W. Rounsefell, Vancouver	Plate glass.	
National Surety Co., New York, N.Y	R. V. Winch, Vancouver	Guarantee.	
Niagara Fire Insurance Co., New York, N.Y	D. Leeming, Victoria	Tornado and automobile, including damage to automobiles in transit by rail.*	
New York Life Insurance Co., New York, N.Y	Milo Phelps, Vancouver	Life.	
New York Plate Glass Insurance Co., New York, N.Y	J. J. Banfield, Vancouver	Plate glass.	
North American Accident Insurance Co., Toronto, Ont	H. H. Shandly, Victoria	Accident, sickness, plate glass.	
North American Life Assurance Co., Toronto, Ont	Ellis W. Keenleyside, Vancouver	Life.	
Northern Life Assurance Co. of Canada, London, Ont	W. H. Clarke, Vancouver	Life.	
Norwich Union Fire Insurance Society, Ltd., Norwich, Eng	B. S. Heisterman, Victoria	Accident, sickness, plate glass, automobile.*	
Norwich Union Life Insurance Society, Norwich, Eng	B. S. Heisterman, Victoria	Life.	
The Ocean Accident & Guarantee Corporation, Ltd., London, Eng	J. R. Hannah, Vancouver	Accident, sickness, guarantee, plate glass, automobile, and burglary.*	
Ocean Marine Insurance Co., Ltd., London, Eng	R. V. Winch & Co., Ltd., Victoria	Marine.	
Phoenix Assurance Co., Ltd., London, Eng	F. W. Rounsefell, Vancouver	Life and marine.*	
Protective Association of Canada, Granby, Que	F. G. Bell, Vancouver	Accident and sickness restricted to members of the Masonic Order.	
The Prudential Insurance Co. of America, Newark, N.J	Chas. Preston, Vancouver	Life.	
Queen Insurance Co. of America, New York, N.Y	R. P. Rithet & Co., Ltd., Victoria	Automobile and inland transportation.*	
Queensland Insurance Co., Ltd., Sydney, Australia	C. Gardiner Johnson, Vancouver	Marine.	
Railway Passengers Assurance Co., London, Eng	British American Trust Co., Vancouver	Accident, sickness, guarantee, plate glass, and automobile.	
The Ridgely Protective Association, Worcester, Mass	John Dunlop, Edmonds	Accident and sickness amongst members of I.O.O.F.	
Reliance Marine Insurance Co., Liverpool, Eng	R. P. Rithet & Co., Ltd., Victoria	Marine.	
Royal Exchange Assurance, London, Eng	H. G. Lawson, Jr., Victoria	Accident, sickness, automobile (restricted to loss from the automobile by burglary or theft).*	
Royal Insurance Co., Ltd., Liverpool, Eng	F. W. Walker, Vancouver	Life.*	
Royal Plate Glass Insurance Co. of Canada, Vancouver, B.C	Head Office, Vancouver	Plate glass	Dominion War Loan Bonds $5,000, and deposit receipt, Canadian Bank of Commerce, $125.
St. Paul Fire & Marine Insurance Co., St. Paul, Minn	B. S. Heisterman, Victoria	Automobile, inland transportation and marine.*	
Scottish Union & National Insurance Co., Edinburgh, Scotland	F. B. Pemberton, Victoria	Tornado, sprinkler leakage, and automobile.	
The Sovereign Life Assurance Co., Winnipeg, Man	A. C. Stewart, Vancouver	Life.	
The Standard Life Assurance Co., Edinburgh, Scotland	J. W. Kerr, Vancouver	Life.	
Sun Life Assurance Co. of Canada, Montreal, Que	J. H. Poff, Vancouver	Life.	
Travelers Indemnity Co., Hartford, Conn	Richard Hall, Victoria	Accident, sickness, steam-boiler, plate glass, burglary, automobile, fly-wheel.	
The Travelers Insurance Co., Hartford, Conn	R. Cecil Hall, Victoria	Life and accident.	
Travellers Life Assurance Co. of Canada, Montreal, Que	J. D. Mather, Vancouver	Life.	
Union Insurance Society of Canton, Ltd., Victoria, Hong Kong	C. R. Elderton, Vancouver	Marine and automobile.*	

LIST OF COMPANIES LICENSED—*Concluded.*

Name of Company and Head Office.	Attorney to receive Process in British Columbia. (Corrected to July 8th, 1918.)	Description of Insurance Business for which Licensed. (Corrected to July 8th, 1918.)	Deposits of Companies other than Dominion Licensees. (Par Values.)
Union Marine Insurance Co., Ltd., Liverpool, Eng.	C. H. Macaulay, Vancouver	Marine, inland marine, inland transportation, accident, automobile (also licensed under "B.C. Fire Insurance Act" to insure automobiles against loss or damage by fire	Can. Northern Pacific Railway Terminal Debenture Stock, £5,000.
Union Mutual Life Insurance Co., Portland, Maine	Viggo F. Laursen, Vancouver	Life.	
United States Fidelity & Guaranty Co., Baltimore, Md.	Leslie H. Wright, Vancouver	Guarantee, accident, sickness, burglary, plate glass, and steam-boiler.	
Western Assurance Co., Toronto, Ont.	W. W. Johnston, Vancouver	Marine, inland transportation, explosion, tornado, and automobile.*	
Western Life Assurance Co., Winnipeg, Man.	H. R. King, Vancouver	Life	Edmonton, Dunvegan and B.C. Ry. Debentures, $30,000, and cash, $187.
The Yang-tsze Insurance Association, Ltd., Shanghai, China	B. G. D. Phillips, Vancouver	Marine.	
Yorkshire Insurance Co., Ltd., York, Eng.	H. W. Dyson, Vancouver	Accident, sickness, plate glass, and live stock.*	

* Also licensed under "B.C. Fire Insurance Act" to transact fire insurance.

† Withdrawing from this Province.

NOTE.—Licensed since December 31st, 1917:—

British America Insurance Co., Toronto, Ont.; attorney, P. R. Brown, Victoria; to transact hail, ocean marine, inland marine, inland transportation, and automobile insurance.
British Traders Insurance Co., Ltd., Victoria, Hong Kong; attorney, C. R. Elderton, Vancouver; to transact automobile insurance.
Continental Casualty Co., Hammond, Ind.; attorney, A. S. Matthew, Vancouver; to transact accident, sickness, and automobile insurance.
Great American Insurance Co., New York, N.Y.; attorney, W. A. Wand, Vancouver; to transact hail, tornado, sprinkler leakage, automobile (excluding insurance against loss by reason of bodily injury), and marine insurance.
Maryland Assurance Corporation, Baltimore, Md.; attorney, L. A. Genge, Victoria; to transact accident and sickness insurance.
Tokio Marine & Fire Insurance Co., Tokio, Japan; attorney, B. G. D. Phillips, Vancouver; to transact marine insurance.
Western Empire Life Assurance Co., Winnipeg, Man.; attorney, C. Wilson, Vancouver; to transact life insurance; deposit, War Loan bonds, $27,000.

ARINE.		LIVE STOCK, STEAM-BOILER, SPRINKLER LEAKAGE, INLAND TRANSPORTATION. AND EXPLOSION. (Indicated by initial letters.)		Total Premiums.	Total Losses.	Unsettled Claims.	
.	Losses.	Premiums.	Losses.				
52	$ 75,402 37	.....	.....	$ 48,195 88	$ 75,502 37	$ 13,084 00	1
201	*Nil.*	.....	.....	12,131 31	1,550 00	*Nil.*	2
3	.....	$1,221 00 S.B.	*Nil.*	1,221 00	*Nil.*	*Nil.*	3
98	10,929 29	.....	.....	17,938 98	10,929 29	*Nil.*	4
47	476 00	.....	.....	19,384 47	476 00	*Nil.*	5
6	.....	.....	.....	12,786 64	5,065 91	*Nil.*	6
7	.....	.....	.....	3,269 32	572 23	*Nil.*	7
8	.....	.....	.....	22,983 94	30,005 84	7,012 50	8
9	.....	.....	.....	5,166 35	*Nil.*	*Nil.*	9
100	26,253 46	.....	.....	51,250 80	26,253 46	4,250 10	10
11	.....	.....	.....	51,642 93	15,423 75	*Nil.*	11
12	.....	.....	.....	6,926 48	2,606 00	108 25	12
13	.....	.....	.....	18,458 54	17,130 18	6,380 00	13
14	.....	962 47 S.B.	*Nil.*	3,285 18	508 26	*Nil.*	14
158	11,333 14	.....	.....	30,823 88	11,956 11	4,910 45	15
16	.....	229 90 S.B.	*Nil.*	12,145 44	3,826 93	11,260 16	16
17	.....	605 95 L.S.	*Nil.*	605 95	*Nil.*	*Nil.*	17
18	.....	.....	.....	43,108 69	29,788 41	4,917 65	18
19	.....	.....	.....	255 00	*Nil.*	*Nil.*	19
20	.....	.....	.....	4,341 87	2,997 55	4,654 00	20
21	.....	.....	.....	69,351 38	67,155 51	.....	21
22	.....	.....	.....	1,056 85	34 15	15 00	22
23	.....	.....	.....	17,909 21	9,816 06	2,061 12	23
240	9,253 39	192 97 I.T.	*Nil.*	29,517 52	17,025 80	1,636 53	24
25	.....	.....	.....	3,211 17	2,720 90	*Nil.*	25
26	.....	.....	.....	3,037 87	1,187 79	*Nil.*	26
213	1,895 66	.....	.....	8,591 13	1,895 66	*Nil.*	27
28	.....	.....	.....	34,619 49	25,215 91	33,905 00	28
29	.....	.....	.....	17,424 95	4,969 23	38 00	29
305	*Nil.*	.....	.....	3,298 05	*Nil.*	*Nil.*	30
31	.....	.....	.....	3,669 00	1,575 21	444 70	31
32	.....	.....	.....	934 90	93 27	*Nil.*	32
337	.....	.....	.....	18 67	.....	.....	33
34	.....	201 75 S.L. 233 98 S.B. 818 20 I.T.	*Nil.* $147 51 *Nil.*	8,239 26	4,273 25	*Nil.*	34
35	.....	.....	.....	17,470 23	5,746 68	1,660 73	35
36	.....	.....	.....	1,152 80	437 26	225 00	36
37	.....	.....	.....	4,116 34	5,085 16	4,280 36	37
38	.....	.....	.....	1,990 93	121 65	*Nil.*	38
39	.....	.....	.....	1,025 70	455 15	*Nil.*	39
40	.....	.....	.....	5,324 25	6,004 67	11,492 00	40
41	.....	.....	.....	6,413 83	1,619 93	80 00	41
43	.....	.....	.....	25,376 43	12,643 09	3,950 00	42
435	812 98	.....	.....	2,680 35	812 98	*Nil.*	43
44	.....	.....	.....	6,915 00	4,299 17	*Nil.*	44
45	.....	.....	.....	4,233 91	1,910 20	235 00	45
465	.....	.....	.....	2,355 45	.....	.....	46
47	.....	.....	.....	42,389 41	26,202 02	13,680 00	47
48	.....	.....	.....	708 00	107 00	109 17	48
495	*Nil.*	.....	.....	5,959 95	*Nil.*	*Nil.*	49
50	.....	.....	.....	8,579 38	1,792 55	1,875 00	50
51	.....	.....	.....	2,069 75	1,458 66	182 75	51
514	4,399 86	4 00 I.L.	.....	21,004 39	4,665 70	741 37	52
53	.....	.....	.....	3,041 35	786 48	*Nil.*	53
54	.....	.....	.....	2,307 68	271 08	*Nil.*	54
55	.....	.....	.....	4,872 19	497 13	*Nil.*	55
562	.....	.....	.....	34,409 22	*Nil.*	*Nil.*	56
575	3,079 48	.....	.....	10,427 60	5,410 30	*Nil.*	57
58	.....	.....	.....	14,559 71	1,795 93	56 00	58
598	*Nil.*	487 63 I.L. 119 31 E.	*Nil.* *Nil.*	7,217 22	*Nil.*	*Nil.*	59
665	9,045 18	.....	.....	5,571 35	9,045 18	*Nil.*	60
61	.....	434 35 L.S.	80 00	936 38	146 45	*Nil.*	61
70	$152,880 81	$5,511 51	$227 51	$809,965 90	$461,869 45	$133,244 84	

NET PREMIUMS AND LOSSES, 1917. MISCELLANEOUS BUSINESS.

Name of Company.	Accident.		Sickness.		Liability.		Automobile.		Burglary.		Guarantee.		Plate Glass.		Marine.		Live Stock, Steam-boiler, Sprinkler Leakage, Inland Transportation, and Explosion. (Indicated by initial letters.)		Total Premiums.	Total Losses.	Unsettled Claims.	
	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.	Premiums.	Losses.				
1. Aetna Insurance Co.							$ 994 36	$ 100 00							$ 47,201 52	$ 75,402 37			$ 48,195 88	$ 75,502 37	$ 13,084 00	1
2. Alliance Assurance Co., Ltd	$ 214 25	*Nil.*	$ 31 50	*Nil.*			911 55	1,550 00			$ 20 00	*Nil.*			10,954 01	*Nil.*			12,131 31	1,550 00	*Nil.*	2
3. Boiler Inspection & Insurance Co.																	$1,221 00 S.B.	*Nil.*	1,221 00	*Nil.*	*Nil.*	3
4. Boston Insurance Co.															17,938 98	10,929 29			17,938 98	10,929 29	*Nil.*	4
5. British & Foreign Marine Insurance Co.															19,384 47	476 00			19,384 47	476 00	*Nil.*	5
6. British Columbia Plate Glass Insurance Co.													$ 12,786 64	$ 5,065 91					12,786 64	5,065 91	*Nil.*	6
7. British Crown Assurance Corporation, Ltd							3,269 32	572 23											3,269 32	572 23	*Nil.*	7
8. Canada Accident Assurance Co.	3,189 80	906 02	1,228 59	595 73	15,486 43	28,102 83	2,192 34	31 05	11 12	*Nil.*	111 20	*Nil.*	764 46	370 21					22,983 94	30,005 84	7,012 50	8
9. Canadian Surety Co.											5,166 35	*Nil.*							5,166 35	*Nil.*	*Nil.*	9
10. Canton Insurance Office, Ltd.															51,250 80	26,253 46			51,250 80	26,253 46	4,250 10	10
11. Dominion of Canada Guarantee & Accident Co.	22,671 14	$ 6,460 76	11,119 69	$ 3,571 76			14,539 80	1,846 43	$ 72 57	*Nil.*	1,950 01	$2,845 70	1,289 72	699 10					51,642 93	15,423 75	*Nil.*	11
12. Dominion Gresham Guarantee & Casualty Co.	3,050 65	1,502 89	1,779 53	570 19	$ 80 00	*Nil.*	1,824 05	532 92	110 25	*Nil.*	82 00	*Nil.*							6,926 48	2,606 00	108 25	12
13. Employers Liability Assurance Corporation, Ltd.	5,757 78	3,163 71	309 00	1,475 31	4,350 32	$ 10,137 44	6,001 19	2,344 97			2,040 25	8 75							18,458 54	17,130 18	6,380 00	13
14. Fidelity & Casualty Co.	267 00	45 18	222 00	121 43	228 00	*Nil.*	497 75	*Nil.*	537 54	*Nil.*			570 42	341 65			962 47 S.B.	*Nil.*	3,285 18	*Nil.*	*Nil.*	14
15. Fireman's Fund Insurance Co.							3,645 30	622 97							27,183 58	11,333 14			30,828 88	11,956 11	4,910 45	15
16. General Accident Assurance Co. of Canada	2,948 02	2,305 96	880 61	289 05	5,135 54	1,231 92	2,951 37	*Nil.*									239 90 S.B.	*Nil.*	12,145 44	3,826 93	11,266 16	16
17. General Animals Insurance Co. of Canada																	605 95 L.S.	*Nil.*	605 95	*Nil.*	*Nil.*	17
18. Globe Indemnity Co. of Canada	21,097 53	19,953 09	14,416 19	5,960 93	1,620 54	3,448 89	5,546 66	425 50	58 00	*Nil.*	369 77	*Nil.*							43,108 69	29,788 41	4,917 65	18
19. Guarantee Company of North America											255 00	*Nil.*							255 00	*Nil.*	*Nil.*	19
20. Guardian Insurance Co. of Canada	1,026 34	266 70	693 60	119 25	820 28	2,558 55	1,215 23	33 55	278 87	$ 5 00	199 50	*Nil.*	108 05	14 50					4,341 87	2,997 55	4,654 00	20
21. Guardian Casualty & Guaranty Co.	*49,038 29	40,282 76			987 89	13,672 71	18,348 64	12,873 45		125 55	937 26	201 04	39 30	*Nil.*					69,351 38	67,155 51		21
22. Home Insurance Co.							1,056 85	34 15											1,056 85	34 15	15 00	22
23. Imperial Guarantee & Accident Insurance Co.	6,906 20	2,612 53	3,371 25	2,130 83			6,224 74	4,926 08			1,269 26	*Nil.*	137 76	146 62					17,909 21	9,816 06	2,061 12	23
24. Insurance Co. of North America							12,842 05	7,772 41							16,482 50	9,253 39	192 97 I.T.	*Nil.*	29,517 52	17,025 80	1,636 53	24
25. Law Union & Rock Insurance Co.	677 86	*Nil.*	226 50	50 00	2,366 81	2,670 90													3,211 17	2,720 90	*Nil.*	25
26. Lloyds Plate Glass Insurance Co.													3,037 87	1,187 79					3,037 87	1,187 79	*Nil.*	26
27. London Assurance Corporation															8,591 13	1,895 66			8,591 13	1,895 66	*Nil.*	27
28. London Guarantee & Accident Co., Ltd.	10,580 16	5,538 60	1,141 15	192 85	11,906 72	17,688 80	6,726 73	1,022 37			4,264 73	773 29							34,619 49	25,215 91	33,905 00	28
29. London & Lancashire Guarantee & Accident Co. of Canada	3,902 73	2,322 20	1,620 30	1,091 23	1,144 44	165 05	5,720 71	873 44			2,793 07	5 00	2,243 70	512 31					17,424 95	4,969 23	38 00	29
30. London & Provincial Marine & General Insurance Co., Ltd.															3,298 05	*Nil.*			3,298 05	*Nil.*	*Nil.*	30
31. Loyal Protective Insurance Co.	*3,669 00	1,575 21																	3,669 00	1,575 21	444 70	31
32. Marine Insurance Co., Ltd.							934 90	93 27											934 90	93 27	*Nil.*	32
33. Maritime Insurance Co., Ltd.															18 67				18 67			33
34. Maryland Casualty Co.	721 36	36 43	663 04	30 00	2,554 06	3,478 88	1,357 01	7 00	739 05	*Nil.*	169 80	293 93	781 01	279 50			201 75 S.L. 233 98 S.B. 818 20 I.T.	*Nil.* $147 51 *Nil.*	8,239 26	4,273 25	*Nil.*	34
35. Merchants Casualty Co	*17,470 23	5,746 68																	17,470 23	5,746 68	1,660 73	35
36. National Provincial Plate Glass & General Insurance Co., Ltd.													1,152 80	437 26					1,152 80	437 26	225 00	36
37. National Surety Co.											4,116 34	5,085 16							4,116 34	5,085 16	4,280 36	37
38. Niagara Fire Insurance Co.							1,990 93	121 65											1,990 93	121 65	*Nil.*	38
39. New York Plate Glass Insurance Co.													1,025 70	455 15					1,025 70	455 15	*Nil.*	39
40. North American Accident Insurance Co.	1,357 68	226 07	181 75	103 57	2,303 01	4,207 90	1,319 50	1,371 83					162 31	95 30					5,324 25	6,004 67	11,492 00	40
41. Norwich Union Fire Insurance Society.	2,838 37	647 02	1,593 61	968 41	13 07	*Nil.*	1,297 98	4 50					670 80	*Nil.*					6,413 83	1,619 93	80 00	41
42. Ocean Accident & Guarantee Co., Ltd.	11,226 26	4,997 53	3,208 29	974 72	3,104 48	5,304 85	5,262 48	850 50	201 75	*Nil.*	391 52	*Nil.*	1,981 65	515 49					25,376 43	12,643 09	3,950 00	42
43. Ocean Marine Insurance Co., Ltd															2,680 35	812 98			2,680 35	812 98	*Nil.*	43
44. Protective Association of Canada.	*6,915 00	4,299 17																	6,915 00	4,299 17	*Nil.*	44
45. Queen Insurance Co. of America.							4,283 91	1,910 20											4,283 91	1,910 20	235 00	45
46. Queensland Insurance Co., Ltd.															2,355 45				2,355 45			46
47. Railway Passengers Assurance Co.	12,907 49	6,786 97	4,877 22	2,423 47	13,842 87	10,207 40	8,034 10	6,535 26	32 00	*Nil.*	1,992 91	3 97	702 82	244 95					42,389 41	26,202 02	13,680 00	47
48. Ridgely Protective Association.	*708 00	107 00																	708 00	107 00	109 17	48
49. Reliance Marine Insurance Co.															5,959 95	*Nil.*			5,959 95	*Nil.*	*Nil.*	49
50. Royal Exchange Assurance Co.	1,802 31	601 44	1,037 01	269 21	760 20	70 00	4,979 86	851 90											8,579 38	1,792 55	1,875 00	50
51. Royal Plate Glass Insurance Co													2,069 75	1,458 66					2,069 75	1,458 66	182 75	51
52. St. Paul Fire & Marine Insurance Co.							2,883 75	265 84							18,116 64	4,399 86	4 00 I.L.		21,004 39	4,665 70	741 37	52
53. Scottish Union & National Insurance Co.							3,041 35	786 48											3,041 35	786 48	*Nil.*	53
54. Travelers Indemnity Co.	889 96	51 79	1,417 72	219 29															2,307 68	271 08	*Nil.*	54
55. Travelers Insurance Co.	4,872 19	497 13																	4,872 19	497 13	*Nil.*	55
56. Union Insurance Society of Canton.							155 80	*Nil.*							34,253 42				34,409 22	*Nil.*	*Nil.*	56
57. Union Marine Insurance Co., Ltd.							4,829 05	2,330 82							5,598 55	3,079 48			10,427 60	5,410 30	*Nil.*	57
58. United States Fidelity & Guaranty Co.	717 57	14 28	518 15	*Nil.*	1,882 55	974 85	473 38	*Nil.*	705 03	*Nil.*	9,087 57	328 30	1,175 46	478 50					14,559 71	1,795 93	56 00	58
59. Western Assurance Co.															6,610 28	*Nil.*	487 63 I.L. 119 31 E.	*Nil.* *Nil.*	7,217 22	*Nil.*	*Nil.*	59
60. Yang-tsze Insurance Association															5,571 35	9,045 18			5,571 35	9,045 18	*Nil.*	60
61. Yorkshire Insurance Co., Ltd.	87 50	*Nil.*	84 50	*Nil.*	185 35	*Nil.*							144 68	66 45			434 35 L.S.	80 00	936 38	146 45	*Nil.*	61
	$197,510 67	$110,947 12	$50,621 20	$21,157 23	$68,712 56	$103,920 97	$135,352 64	$50,690 77	$2,746 18	$130 55	$35,216 54	$9,545 14	$30,844 90	$12,369 35	$283,449 70	$152,880 81	$5,511 51	$227 51	$809,965 90	$461,869 45	$133,244 84	

*Accident and sickness.

ABSTRACT OF THE RETURNS OF LIFE INSURANCE COMPANIES TRANSACTING BUSINESS IN THE PROVINCE OF BRITISH COLUMBIA DURING 1917.

Name of Company.	Premiums for the Year.	Number of Policies, new and taken up.	Amount of Policies, new and taken up.	Number of Policies in Force at Date.	Net Amount in Force.	Number of Policies become Claims.	Net Amount of Policies become Claims.	Claims paid including Matured Endowments.	Unsettled Claims.		Amount invested in British Columbia.	
									Not resisted.	Resisted.	On Mortgages.	On other Securities.
1. Canada Life Assurance Co	$ 192,371 52	479	$ 878,860 00	2,431	$5,983,407 00	36	$ 91,519 00	$ 80,419 00	$ 20,100 00	*Nil.*	$ 600,664 31	* $1,353,356 48
2. Capital Life Assurance Co. of Canada	1,740 90	2	4,500 00	12	30,000 00	.....	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*	* 34,658 25
3. Confederation Life Association	145,685 39	775	1,390,320 00	2,845	5,230,371 00	.....	71,706 00	65,041 00	17,665 00	*Nil.*	1,410,562 22	* 244,260 10
4. Continental Life Insurance Co	30,846 50	74	1,175 00	527	863,837 00	3	7,000 00	7,500 00	*Nil.*	*Nil.*	3,000 00	* 83,210 24
5. Crown Life Insurance Co	79,670 69	.....	460,250 00	.....	2,631,603 00	7	11,541 35	20,875 00	4,041 35	*Nil.*	40,600 00	* 61,026 40
6. Dominion Life Assurance Co	14,458 25	31	51,375 00	275	481,375 00	1	1,000 00	2,040 00	2,000 00	*Nil.*	86,950 00	* 38,151 13
7. Equitable Life Assurance Society of U.S.	78,968 71	70	138,000 00	1,055	2,280,866 00	15	28,742 65	20,884 65	18,077 00	*Nil.*	386,000 00	* 328,497 00
8. Excelsior Life Insurance Co	44,525 92	.....	362,000 00	.....	1,182,708 00	6	12,069 20	13,566 70	1,389 20	*Nil.*	*Nil.*	*Nil.*
9. Great West Life Assurance Co	447,141 86	.....	2,670,310 00	.....	11,483,388 00	.....	141,763 55	121,396 75	56,018 15	*Nil.*	543,058 16	23,460 27
10. Gresham Life Assurance Society	4,878 98	.....	6,500 00	.....	113,015 00	.....	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*
11. Imperial Life Assurance Co	132,662 97	512	911,373 00	1,890	3,630,000 00	.....	21,564 20	16,962 20	10,064 20	*Nil.*	133,779 65	* 308,956 30
12. London Life Insurance Co	16,149 98	235	344,000 00	427	649,850 00	4	6,113 00	11,199 00	*Nil.*	$ 5,000	*Nil.*	* 217,275 70
13. London & Lancashire Life & General Assurance Association, Ltd	30,399 00	54	152,154 00	.....	.....	6	18,908 25	26,408 25	500 00	*Nil.*	*Nil.*	* 134,475 50
14. Manufacturers Life Insurance Co	61,990 29	85	249,651 00	335	1,536,803 00	15	19,000 00	14,000 00	11,000 00	20,000	2,099 70	* 596,220 97
15. Metropolitan Life Insurance Co { Ordinary	148,339 17	1,465	1,290,000 00	5,536	4,685,000 00	52	39,431 94	37,931 94	7,000 00	*Nil.*	.....	.....
{ Industrial	166,628 30	9,398	1,150,000 00	36,179	4,445,000 00	275	41,074 19	40,580 69	1,101 00	*Nil.*	5,585 00	* 1,082,597 09
16. Monarch Life Assurance Co	96,843 36	.....	1,244,990 00	.....	3,038,025 00	5	12,427 46	14,427 46	*Nil.*	5,000	17,555 34	* 21,423 71
17. Mutual Life Assurance Co. of Canada	297,430 69	691	1,132,561 00	4,376	8,111,680 00	58	115,342 00	105,442 00	24,400 00	50,000	555,156 86	* 759,948 46
18. Mutual Life Insurance Co. of N.Y	91,805 23	100	245,064 00	1,636	3,275,325 00	31	90,946 00	76,473 00	14,473 00	*Nil.*	*Nil.*	*Nil.*
19. National Life Assurance Co. of Canada	50,123 16	97	190,928 00	.....	1,135,538 00	12	36,930 00	19,430 00	17,500 00	*Nil.*	*Nil.*	206,973 00
20. New York Life Insurance Co	341,782 67	596	1,105,445 00	4,436	9,380,297 00	85	208,296 65	197,423 89	34,548 01	100,000	1,052,500 00	† 18,300 00
21. North American Life Assurance Co	151,286 40	394	738,810 00	2,409	4,487,357 00	.....	37,889 25	38,637 65	10,500 00	*Nil.*	589,900 82	* 740,367 64
22. Northern Life Assurance Co. of Canada	11,460 26	.....	148,500 00	171	321,550 00	4	4,202 20	3,000 00	1,202 20	*Nil.*	5,000 00	* 95,581 26
23. Norwich Union Life Insurance Society	421 87	.....	*Nil.*	.....	8,350 00	.....	*Nil.*	*Nil.*	*Nil.*	*Nil.*	117,500 00	† 33,846 67
24. Phoenix Assurance Co., Ltd	11,166 02	16	29,500 00	147	412,675 00	5	8,305 50	7,303 00	1,002 50	*Nil.*	*Nil.*	*‡§ 51,798 74
25. Prudential Insurance Co. of America { Ordinary	72,755 69	780	892,838 00	2,552	2,742,178 00	21	23,853 32	27,353 32	4,000 00	.....	.....	.....
{ Industrial	112,518 07	5,814	1,043,081 00	20,533	3,172,222 00	232	50,391 95	49,140 50	2,872 75	*Nil.*	*Nil.*	*§ 337,937 11
26. Royal Insurance Co., Ltd	71,232 30	90	278,222 00	856	2,423,573 00	13	33,318 53	88,598 53	4,060 00	*Nil.*	*Nil.*	§ 26,523 17
27. Sovereign Life Assurance Co. of Canada	23,510 63	145	320,000 00	.....	712,435 00	.....	6,000 00	6,000 00	*Nil.*	10,000	*Nil.*	* 37,000 00
28. Standard Life Assurance Co. ‖	32,172 43	23	67,000 00	391	933,887 00	13	27,680 00	14,559 53	16,738 22	50,000	305,000 00	† 115,991 55
29. Sun Life Assurance Co. of Canada	306,356 80	421	710,123 00	4,394	8,488,555 00	.....	139,050 00	152,600 02	48,360 72	*Nil.*	1,374,254 83	* 1,415,566 29
30. Travelers Insurance Co	13,777 45	39	115,500 00	136	447,662 00	1	2,000 00	2,000 00	*Nil.*	*Nil.*	*Nil.*	† 361,000 00
31. Travellers Life Assurance Co. of Canada	3,139 26	1	1,000 00	45	111,000 00	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*	*Nil.*
32. Union Mutual Life Insurance Co	16,702 18	14	34,000 00	302	545,500 00	14	19,590 86	17,585 90	2,004 96	*Nil.*	*Nil.*	† 129,966 67
33. Western Life Assurance Co	11,596 65	145	273,000 00	.....	334,200 00	*Nil.*	*Nil.*	4,000 00	*Nil.*	*Nil.*	4,774 15	*Nil.*
	$3,313,039 55	.....	$18,631,030 00	.....	$95,309,232 00	.....	$1,327,657 05	$1,302,779 98	$330,618 26	$240,000	$7,233,941 04	$8,858,369 70

* Book value. † Par value. ‡ Market value. § Including loans on policies. ‖ Year ended November 15th, 1917.

RETURNS TO DECEMBER 31ST, 1917, OF PROVINCIAL LICENSEES OTHER THAN FIRE AND MARINE INSURANCE COMPANIES.

ASSETS.

Name of Company.	Real Estate.	Mortgages.	Bonds, Stocks, and Loans.	Interest accrued.	Outstanding Premiums and Agents' Balances.	Cash in Office or on Deposit.	All other Assets.	Total.
1. British Columbia Plate Glass Insurance Co			$10,550 62		$2,237 62	$3,734 18		$16,522 42
2. National Plate Glass Insurance Co	$416 18	$3,550 00	8,167 36	$523 05	983 64		$134 52	13,774 75
3. Royal Plate Glass Insurance Co		2,250 00	5,075 00	109 30	805 01	806 96		9,046 27
Totals	$416 18	$5,800 00	$23,792 98	$632 35	$4,026 27	$4,541 14	$134 52	$39,343 44

LIABILITIES.

Name of Company.	Unpaid losses.	Unearned Premiums.	Other Reserves.	Other Liabilities.	Total except Paid-up Capital.	Capital Stock paid-up.	Total including Paid-up Capital.
1. British Columbia Plate Glass Insurance Co		$ 9,905 25			$ 9,905 25	$ 3,840 00	$13,745 25
2. National Plate Glass Insurance Co		2,282 35		$1,624 56	3,906 91	5,430 00	9,336 91
3. Royal Plate Glass Insurance Co		2,095 20		391 24	2,486 44	2,750 00	5,236 44
Totals		$14,282 80		$2,015 80	$16,298 60	$12,020 00	$28,318 60

RECEIPTS.

Name of Company.	Premiums.	Interest.	Calls on Capital Stock.	All other Receipts.	Total.
1. British Columbia Plate Glass Insurance Co	$12,786 64	$ 500 43		$162 74	$13,449 81
2. National Plate Glass Insurance Co	2,758 69	678 50		79 10	3,516 29
3. Royal Plate Glass Insurance Company	1,232 32	409 27			1,641 59
Totals	$16,777 65	$1,588 20		$241 84	$18,607 69

EXPENDITURES.

Name of Company.	Expenses of Management.	Losses paid.	Dividends.	All other Expenditure.	Total.
1. British Columbia Plate Glass Insurance Co	$5,070 48	$5,065 91			$10,136 39
2. National Plate Glass Insurance Co	1,108 36	2,437 82		$250 00	3,796 18
3. Royal Plate Glass Insurance Co	450 03	1,458 66		212 03	2,121 32
Totals	$6,628 87	$8,962 39		$462 03	$16,653 89

INDEX.

ANNUAL STATEMENTS.

PAGE.

Agricultural Insurance Co. 9
Alliance Insurance Co. of Philadelphia 9
Boston Insurance Company 9
British Columbia Plate Glass Insurance Co. 16
British Crown Assurance Corporation, Ltd. 9
Canton Insurance Office, Ltd. 18
Century Insurance Co., Ltd. 9
Citizens' Insurance Co. of Missouri 9
Commercial Union Fire Insurance Co. of New York 9
Detroit Fire & Marine Insurance Co. 9
Fire Association of Philadelphia 9
Guardian Fire Insurance Company of Utah 9
Guardian Casualty & Guaranty Co. of Utah 19
Industrial Fire Insurance Co. 9
London & Provincial Marine & General Insurance Co., Ltd. 19
Maritime Insurance Co., Ltd. 21
Mechanics' & Traders Insurance Co. 9
Merchants Fire Assurance Corporation of New York 9
Michigan Fire and Marine Insurance Co. 9
National Benefit Life & Property Assurance Co., Ltd. 9
National Plate Glass Insurance Co. 22
Newark Fire Insurance Co. 9
New Jersey Fire Insurance Co. 9
Northwestern Mutual Fire Association 9
Ocean Marine Insurance Co., Ltd. 24
Pacific Fire Insurance Co. 9
Pacific States Fire Insurance Co. 9
Queensland Insurance Co., Ltd. 26
Reliance Insurance Co. of Philadelphia 9
Reliance Marine Insurance Co. 28
Rhode Island Insurance Co. 14
Royal Plate Glass Insurance Co. of Canada 30
Svea Fire & Life Insurance Co., Ltd. 9
Union Marine Insurance Co., Ltd. 9
Vulcan Fire Insurance Co. 9
Yang-tsze Insurance Association, Ltd. 31

TABLES.

Fire Insurance—
- Companies licensed, List of December 31st, 1917 34
- Companies admitted during 1917 5
- Companies which withdrew during 1917 5
- Premiums and Losses (net), 1917 37

TABLES—*Concluded.*

PAGE.

Fire Reports—
General Remarks 6
I. Districts reporting 40
II. Causes of Fires 42
III. Classification of Property burned 43
IV. Summary, 1912-17 47
V. Loss of Life, 1916-17 47
Life Insurance—
Companies licensed, List of December 31st, 1917 48
Business in British Columbia 53
Miscellaneous Insurance—
Companies licensed, List of December 31st, 1917 48
Companies admitted, 1917 7
Companies which withdrew, 1917 7
Assets, Provincial Licensees 54
Liabilities, Provincial Licensees 54
Receipts, Provincial Licensees 54
Expenditure, Provincial Licensees 54
Premiums and Losses (tabulated) 51
Investments in British Columbia—
Life Companies 53
Other Companies 39

VICTORIA, B.C.:
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1918.

PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

COMMISSIONER OF FISHERIES

FOR THE YEAR ENDING DECEMBER 31ST, 1917

WITH APPENDICES

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

I beg to submit herewith a report reviewing the operations of the Provincial Fisheries Department for the year ending December 31st, 1917, with Appendices.

WILLIAM SLOAN,

Commissioner of Fisheries.

Provincial Fisheries Department,

Commissioner of Fisheries' Office,

Victoria, British Columbia, April 10th, 1917.

TABLE OF CONTENTS.

FISHERIES COMMISSIONER'S REPORT FOR 1917.

PAGE.

Standing with other Provinces 7

Species and Value of Fish marketed 7

The Salmon-catch of 1917 8

The Salmon-pack of the Fraser River 8

The Salmon-pack of the Northern and Vancouver Island Districts 10

Scientific Research 10

The Salmon Investigation of 1917 10

Dr. Gilbert's Salmon Investigations of 1916 and 1917 11

F. W. Weymouth's Crab Investigations of 1917 14

Dr. Stafford's Report on the Native Oyster of British Columbia 15

Reports from Spawning Beds of Province in 1917 15

Digest of the Report of the Dominion Fisheries Commission of 1917 16

Hatchery Egg Collections 18

APPENDICES.

THE SPAWNING-BEDS OF THE FRASER 20

THE SPAWNING-BEDS OF RIVERS INLET 25

THE SPAWNING-BEDS OF SMITH INLET 29

THE SPAWNING-BEDS OF THE NASS RIVER 30

CONTRIBUTION TO THE LIFE-HISTORY OF THE SOCKEYE SALMON. (Paper No. 4.) By Dr. C. H. Gilbert 33

CONTRIBUTION TO THE LIFE-HISTORY OF THE PACIFIC COAST EDIBLE CRAB. (Paper No. 3.) By F. W. Weymouth 81

THE NATIVE OYSTER OF BRITISH COLUMBIA. By Dr. Joseph Stafford 91

THE SOCKEYE RUN ON THE FRASER RIVER. By Dr. C. H. Gilbert 113

THE SALMON-FISHERY OF THE FRASER RIVER DISTRICT. By John P. Babcock 116

SALMON-PACK OF 1917 IN DETAIL 124

SALMON-PACK OF PROVINCE 1902 TO 1917, INCLUSIVE 125

FISHERIES COMMISSIONER'S REPORT FOR 1917.

Standing with other Provinces.

The value of the fishery products of Canada for the year ending March 31st, 1917, totalled $39,208,378. Of that amount British Columbia produced $14,637,346, or 37.33 per cent.

British Columbia, as in recent years, again leads the Provinces of the Dominion in the value of her fishery products. Her output exceeded that of Nova Scotia by $4,544,444, and equalled the total combined fishery products of all the other Provinces of the Dominion.

The following statement gives in their respective order of rank the fishery products of the Provinces of the Dominion for the year ending March 31st, 1917:—

British Columbia	$14,637,346
Nova Scotia	10,092,902
New Brunswick	5,656,859
Quebec	2,991,624
Ontario	2,658,993
Manitoba	1,390,002
Prince Edward Island	1,344,179
Saskatchewan	231,946
Alberta	144,317
Yukon	60,210
Total	$39,208,378

The Species and Value of Fish marketed in British Columbia.

The total value of each species of fish taken in British Columbia for the year ending March 31st, 1917, is given in the following tabulation:—

Salmon	$10,543,505
Cod	554,463
Herring	1,009,383
Whiting	1,087
Shad	825
Octopus	2,012
Halibut	2,026,670
Flounders	14,896
Smelts	18,440
Trout	2,675
Oolachans	68,398
Soles	56,752
Sturgeon	13,190
Perch	9,250
Skate	6,288
Tomcod	664
Dogfish	1,911
Mixed fish	17,310
Shrimps	4,380
Oysters	28,897
Clams	63,845
Crabs	32,002
Fur-seal skins	4,770
Salmon-roe	17,520
Fish-oil	15,949
Whale-oil	250,722
Bone-meal	12,319
Gill-bone	3,340
Fertilizer	85,885
Total	$14,637,346

The total value for the year shows an increase over that of previous years of $99,026.

The salmon products for the fiscal year show a slight decrease in value when compared with those of the previous year. Halibut shows an increase of $54,386 in value, notwithstanding that the catch was 7,182,000 lb. less. The value of the catch of herring was the same as in the previous year, though the catch was some 37,000 lb. greater. The whaling season netted a catch of 403 whales, as against 229 made in previous year. The value of the whale products shows an increase of $119,561.

During the year ending March 31st, 1917, the number of men engaged in the fisheries totalled 18,355, as against 17,820 in the previous year. The following statement gives the number of persons engaged and the value of fish-packing establishments, vessels, boats, and apparatus used in the fisheries of the Province:—

	No.	Value.
Steam fishing-vessels (tonnage, 1,443)	32	$ 635,424
Sailing and gasolene vessels	201	851,956
Boats (sail)	3,379	262,698
Boats (gasolene)	2,217	1,042,620
Carrying smacks	171	116,821
Gill-nets, seines, trap and smelt nets, etc.	6,459	1,612,790
Halibut dories	46	4,600
Trawls	35	1,750
Hand-lines	5,495	10,329
Crab-traps	440	4,400
Halibut gear (skates)	3,000	47,500
Salmon-canneries	84	3,301,573
Salmon-traps	2	6,000
Freezers and ice-houses	21	1,616,500
Smoke and fish houses	41	147,940
Fishing piers and wharves	94	486,047
Whaling-stations	4	175,855
Oil-factories	1	43,500
Clam-canneries	1	3,000
Total		$10,371,303

Number of men employed on vessels	1,205
Number of men employed on boats	10,263
Number of men employed on carrying smacks	89
Number of persons employed in fish-houses, freezers, canneries, etc.	6,798
Total	18,355

THE SALMON-CATCH OF 1917.

The salmon-catch in the Province during the season of 1917 produced a pack of 1,557,485 cases. It exceeded by 203,584 cases the pack of any previous year, notwithstanding the serious shortage in the run of sockeye salmon to the Fraser River. The increase in the total pack is due to the increased canning of pinks and chums, commonly termed "fall salmon." Of the total pack, the Fraser produced 402,538 cases; Vancouver Island, 353,334; the Skeena, 292,219; the Nass, 119,495; Rivers Inlet, 95,302; and outlying districts, 294,597 cases. A statement, supplied by the British Columbia Salmon Canners' Association, giving the pack in detail is attached hereto, and will be found at the conclusion of the Appendix.

The catch of sockeye salmon in the Province produced a pack of only 339,484 cases, although 1917 was a year for a big run to the Fraser. Pink salmon gave a pack of 496,759, a large increase over any former year. Chum salmon also shows a marked increase, with a pack of 476,273 cases. The red and white spring-salmon catch produced a pack of 76,276 cases.

THE SALMON-PACK OF THE FRASER RIVER.

The Fraser River produced a total pack of 402,538, as against 127,472 cases in 1916, 320,519 in 1915, 349,294 in 1914, and 782,429 cases in the previous "big year" (1913). There was a

pronounced gain over any former year in the pack of both pink and chums, the former totalling 134,442 and the latter 59,973. The pack of cohoes totalled but 25,896 cases, a marked decline from that of each of the last three seasons. The catch of sockeye produced a pack of 148,164 cases. Though much greater than the pack in the two preceding years, it was 419,039 cases less than in the previous big year (1913) and 50,019 cases less than in 1914, a lean year. The failure of the sockeye to run to the Fraser as abundantly this season as in former big years was the most serious feature of the 1917 season in both the Province and in the State of Washington. The pack of sockeye caught in Provincial waters of the Fraser River District totalled but 148,164 cases, as against 736,661 cases in the previous big year (1913), 585,435 cases in 1909, and 837,489 cases in 1905. The catch of sockeye in the State of Washington waters of the Fraser River District this year produced a pack of 411,538 cases, as against 1,664,837 cases in the previous big year (1913), 1,005,120 cases in 1909, and 847,122 in 1905. The total pack of sockeye in the Provincial and State waters of the Fraser River District in 1917 was 1,841,786 cases less than 1913, the previous big year; a decrease of 76 per cent.

The remarkable decline in the run of sockeye to the Fraser River District this year was unquestionably due to the failure of the run of 1913 to reach the spawning area of the Upper Fraser watershed that season. That it was not due to a failure of the fishermen to catch the fish is demonstrated by the increased number of fishermen engaged and the increased amount of gear employed on both sides of the International Line. In Provincial waters 2,606 gill-nets were fished in the Gulf of Georgia and the channels of the Fraser and seven traps were employed in Juan de Fuca Strait. In the State of Washington waters of the district licences were issued for 274 traps, 411 purse-seines, 112 drag-nets, and 394 gill-nets. That the decrease in the catch was due to a small run is further shown by the small numbers of sockeye that reached the spawning area this fall.

That the decrease in the run was due to the failure of the 1913 run to reach the spawning area of the Upper Fraser watershed is shown by the following summary of the Department's report on the spawning-grounds in 1913, taken from pages 37 and 38 of that year:—

"*Summary of Conditions above the Fishing Limits and on the Spawning-grounds.*—From the foregoing statement of conditions existing above the fishing limits and upon the spawning-grounds of the Fraser River, I feel fully justified from my investigations in concluding that the number of sockeye which passed above the fishing limits was as great this year as any preceding big run of which we have a record, and I think even greater. The sockeye made their appearance in the canyon above Yale in June, and during the high waters of that month and July large numbers passed through to Quesnel and Chilko Lakes. The greater proportion of the run of sockeye in late July and in August and September were blockaded in the canyon by rock-obstructions placed in the channel, incident to the construction of the Canadian Northern Pacific Railroad, so that few were able to pass through during that time. No humpbacks succeeded in passing through the canyon. The blasting of temporary passage-ways enabled a large proportion of the sockeye run of October and November to pass through the canyon. Sockeye were seen drifting down-stream, between Hell's Gate and Yale, in August; the movement was very pronounced in September, and continued until the middle of October. The streams which enter the Fraser between Hell's Gate and Agassiz were filled with sockeye from the middle of August until the end of October, while they had not been observed in those streams in previous years. Very few sockeye spawned in any of these streams, and most of them died without spawning. Great numbers of dead sockeye, which had died without spawning, were found on the bars and banks of the Fraser between Yale and Agassiz in September and October. The number which reached Quesnel Lake was little more than an eighth of the number which entered that lake in 1909. The run to Chilko Lake was equally small. The sockeye run to Seton Lake was 30,000, as against 1,000,000 in 1909. The August and September run of sockeye to Shuswap and Adams Lakes was much less than in any former big year, and the October and November run was also less. The sockeye-eggs collected there this year totalled but 9,000,000, as against 27,500,000 four years ago and 18,000,000 in 1905. The run to Lillooet Lake was less than any recent year. Finally, the run to Harrison Lake was slightly better than in 1909.

"These facts, in my opinion, warrant the conclusion that the number of sockeye which spawned in the Fraser River watershed this year was not sufficient to make the run four years hence even approximate the runs of either 1905, 1909, or 1913."

THE SALMON-PACK IN THE NORTHERN AND VANCOUVER ISLAND DISTRICTS.

The catch of salmon from the estuaries and streams of Vancouver Island, exclusive of the traps on the southern shore of the island, shows a great increase, mainly in chums. The catch produced a pack of 240,381 cases of chums, 49,156 pinks, 31,733 cohoes, 19,509 red and white spring, and 9,639 sockeye.

The pack of the Skeena River totalled 292,219 cases, the record high pack for that river; a gain over that of 1916 of 69,061 cases. Sockeye produced 65,760 cases, as against 60,293 cases in 1916 and 116,538 cases in 1915. The pack of pinks shows a marked increase over any former year and totalled 148,319 cases. Cohoes produced a pack of 38,465 cases, as against 47,409 in 1916 and 32,190 in 1915. The pack of spring was 16,285 cases, 4,648 cases less than in the previous year.

The 1917 pack on Rivers Inlet totalled 95,302 cases, or 10,000 cases more than in 1916. There was a gain of 16,259 cases in sockeye. Because the cannery at Namu packed a portion of the catch of sockeye made at Rivers Inlet which are not credited to that inlet, the catch there the past three years has been greater than that shown in the return. The catch of fall salmon—pinks and chums—is never large at Rivers Inlet.

The Nass River 1917 pack totalled 119,495 cases, a decline from 1916 of 7,800 cases. The pack of sockeye was 22,188, or 9,223 cases less than in 1916. The pack of pinks was 44,568, as against 59,593 cases in 1916, a loss of 15,025. The pack of 24,938 cases of chums shows an increase over that of 1916 of 13,738 cases.

The pack of sockeye on the Nass this year was the lowest made since 1907, when 23,411 cases were packed. The average for the decade on the Nass is 30,785 cases. Dr. Gilbert states in his digest of this year's run: "We search in vain for anything in the past history of the Nass that can explain the poor run in 1913 and again in 1917." At the time he wrote he did not know of the fact that this season, for the first time, a salmon-trap was operated off the shore of one of the small islands in American waters just north of the International Boundary-line, which intercepted a run of sockeye passing along the northern line of Dixon Entrance. The trap is stated to have caught over 10,000 cases of sockeye. The fish were of large size, fine colour, very oily, and of a better quality than any of the Alaska fish of that vicinity. They closely resembled the Nass River sockeye. Traps operated in the narrow channels behind this and neighbouring islands catch no such quality of sockeye. The fish taken in this outer trap apparently drift up on the tide and then turn to circle out into the deeper channel leading towards Portland Canal. It cannot now be stated that the fish taken by this trap were Nass River sockeye, but, if they were, one explanation is offered of the decline in the sockeye-catch in 1917. If they were Nass River breed sockeye the run to that river may be seriously affected hereafter, since it is stated that additional traps will be driven in that vicinity in 1918. If they are, they may divide up the catch made there instead of increasing it. The situation is one of concern. The Department has made arrangements for the collection of data that is expected to demonstrate whether or not the fish taken in these traps are Nass River breed sockeye.

SCIENTIFIC RESEARCH.

The Department continued, during the year, its investigations of the life-history of important food-fish. The following papers will be found in the Appendix of this report:—

"Contribution to the Life-history of the Sockeye Salmon" (No. 4), by Charles H. Gilbert, Ph.D.

"The Sockeye Run on the Fraser River: its present Condition and its Future Prospect," by Charles H. Gilbert, Ph.D.

"Salmon-fishery of the Fraser River," by John Pease Babcock.

"Contribution to the Life-history of Pacific Crab" (No. 3), by F. W. Weymouth.

"The Native Oyster of British Columbia," by Joseph Stafford, M.A., Ph.D.

THE SALMON INVESTIGATION OF 1917.

The Department continued its salmon investigations through the season. Data was collected, as in past seasons, from the principal sections frequented by salmon. The data collected has been reported upon by Dr. Gilbert. His papers cover both 1916 and 1917. Through circumstances that were unavoidable, Dr. Gilbert was unable to furnish a report in time for insertion in the Department's report for 1916. The report is issued herewith.

Contribution to the Life-history of the Sockeye Salmon.

Dr. Gilbert's fourth contribution to the life-history of the sockeye salmon, which is issued herewith, adds two additional years to the records of the runs to the main streams of British Columbia. The present paper contains a graphic analysis of the runs of sockeye salmon to the Fraser, Skeena, and Nass Rivers and Rivers Inlet and Smith Inlet in 1916 and 1917, throws many side-lights on the lives of these fish, adds materially to the evidence of their remarkable homing instinct, indicates the data necessary to follow the questions of sectional racial differences to a conclusion, deals with the significance of the run of grilse to the Fraser in 1916, and adds force to the statement that the runs of salmon to the rivers of this Province have received a close and discriminating study unequalled in any other State.

We now have comparative records covering the sockeye runs to the Fraser for seven consecutive years, and records for six consecutive years for the other important sockeye-streams of the Province, that are of great value.

The Homing Instinct of the Fraser Sockeye.—As a result of Dr. Gilbert's study of the runs to the Fraser River, the conclusion seems inescapable that they consist of a number of sub-races, each bound to its own spawning area within that basin. On the fishing-grounds at times during the season they run separately and their characteristics are easily determined. At other times two may be found in company, but each may be distinguished. At still other times a large number of strains appear hopelessly intermingled. If this be true, as he points out, not only do sockeye return to their own river-basin at maturity, but they predominantly return to the particular part of the river-basin in which they were reared as fingerlings, in which case their homing instinct is far more rigid in its working than has heretofore been accepted. How rigid cannot at this time be stated. Do the salmon which develop from eggs deposited in the gravel of the Horsefly, a tributary of Quesnel Lake, return at maturity not only to the Quesnel, but also to the Horsefly? Data contained in Dr. Gilbert's present paper bearing on this question makes such a supposition appear by no means improbable. This problem has such an important bearing on hatchery propagation, as well as the forecasting of future runs, that the Department will press it to a conclusion.

For the purpose of throwing additional light on the theory of racial differentiation within the Fraser basin, and defining the extent of the homing instinct, Dr. Gilbert has continued his examination of the nuclear rings of the scales of numerous individuals taken on different dates throughout the season upon both the fishing and spawning grounds. The most delicate test of racial differences is found on the small centres or nuclear area of the scales of the salmon. It is that part of the scale produced during the life of the fingerling salmon in fresh water. There is there recorded such peculiarities of growth as accompany life in one particular body of fresh water. A large variety of waters are offered in the Fraser basin which afford the final goal of the sockeye, and which furnish the home of their progeny up to the time of their seaward migration. There the young react to the physical and biological peculiarities of their special lake. Peculiarities of growth and habit are recorded on their scales. These scales in turn become the centres of the scales of the adults. They are an ever-present record of the growth and habits of the young. If the rate of growth and the habits of the young in any particular lake differ from those in other lakes, that difference is recorded on their scales. Because growth in the sea is very similar to all schools there is little that is distinctive recorded on the scales during that period of the life of the salmon, except seasonal growth. Having shown by the study of the scales that the season run of adult sockeye to the Fraser is not a homogeneous assembly, but consists of a number of distinct groups, Dr. Gilbert assumes that they are bound for separate spawning-grounds. By an examination of the scales from distinct spawning areas it is shown that there are racial characteristics of pure strain—different colonies of sockeye—to be found. In all but two localities of the many examined in the spawning area they could be readily distinguished. He presents in his present paper photographs of scales from four different localities showing marked differences, each displaying characteristics peculiar to its location. The most pronounced case is that of the sockeye that spawn in the Harrison River. A comparison of the photographs of the scales of the Harrison River fish with those from other spawning districts reproduced in Dr. Gilbert's paper shows clearly the striking way in which they are marked. The centres are wholly dissimilar from those of other spawning-grounds. There is no evidence of lake-growth, and there is no definite margin to the first year's growth.

It is the form of what is recognized as "the sea-type"—individuals which passed to sea before the scales developed. This group is not numerously represented in any sockeye run. None of this type were found in any other spawning district except two doubtful examples from Harrison Lake. It is, Dr. Gilbert states, possible that the sea-type found in the Fraser are largely, if not wholly, the product of this one district, and furnish a clear-cut case of the parent-stream theory as applied to the tributaries of a river.

The Significance of Grilse in the 1916 Run to the Fraser River.—In previous contributions to this series, Dr. Gilbert has noted that in the run of sockeye to the Fraser, in the years preceding the big year of each cycle, there is a large number of three-year old grilse, and during the other years of the cycle these small males are fewer in number, as was the case in 1912. In that year they constituted numerically 21 per cent. of the run. As these grilse are derived from the eggs of the preceding big-year run, their relative numbers during the year of their abundance may furnish an indication of the size of the run in the succeeding year, which is a big year. Thus, if it were shown that there were less grilse in the run of 1916 than in the run of 1912, it might occasion apprehension that the run in 1917 would fail to equal that of 1913. The run of 1916 offered the first opportunity to apply the test. In 1912, with a pack of over 325,000 cases, tests made demonstrated that 21.5 per cent. consisted of grilse. The run of 1916 produced a pack of less than 117,000 cases. It is clear, therefore, that if the grilse in 1916 had been as numerous as they were shown to have been in 1912 they would have constituted approximately 40 per cent. of the run. Dr. Gilbert demonstrates that the facts were far otherwise. In the first place, the grilse did not run throughout the season of 1916 as they did in 1912. None were found in May, June, or the first half of July. The first were taken on July 17th. On July 27th the catch of the Vancouver Island traps contained 11 per cent. of grilse. The main run in 1916 occurred between July 23rd and August 16th. Probably three-quarters of the sockeye-catch was made between those dates. In that period 12 per cent. of the catch consisted of grilse. The earlier part, about one-quarter of the run, contained no grilse. Allowing for this, the number of grilse present during the season is reduced to close to 10 per cent. of the entire run, or 11 per cent. less than in the run of 1912. As stated, had they been as numerous as in the run of 1912, they should have constituted 40 per cent. of the 1916 run. It is apparent, therefore, that the grilse in the 1916 run had suffered a reduction of 75 per cent. This was due, unquestionably, to the blockade in 1913. Accepting this as indicating the number of four-year fish in the 1917 run, they would be reduced by 75 per cent. below the run of 1913. As the pack of 1913 amounted to 2,300,000 cases, an estimate for 1917, on the above basis of the per cent. of grilse in 1912, would give a pack of 600,000 cases. The pack of 1917 totalled 535,152 cases. It is therefore shown that during the years when the big run still existed the number of grilse present in the run of the preceding year formed a fairly reliable index of the magnitude of the run that could be anticipated. The value of such a demonstration to canners and fishermen cannot be overestimated.

The Four- and the Five-year Sockeye in the Fraser.—As the result of his continued examination of the scales of the sockeye of the Fraser, Dr. Gilbert expresses the belief that intrinsic factors decide largely, if not wholly, the age at which a fingerling sockeye will reach maturity, and that in a given race the percentage maturing at different ages will remain relatively constant from year to year. The belief is expressed that the spawning runs to the streams in the upper section of the Fraser basin enjoy practical isolation, each from the other. Isolation results in divergence. The run to the Chilcotin in 1916 and to Quesnel in 1917 contained only four-year-old fish, while the run to the lower—the Harrison Lake—section was marked by a heavy preponderance of five-year fish. All the pronounced tributaries of the Fraser that produce five-year-old fish are below the canyon and are not noticeably affected by the quadrennial run. They have had, the records show, no greater number of spawning fish in the big year than in the lean years. This demonstrates why there has been no pronounced increase in the percentage of five-year fish in the run of the year following the big run. They are bred predominantly in the lower section, which is unaffected by the big-year run. This explains what could not be explained before—the small proportion of the five-year group in the run to the Fraser in 1914. If the five-year fish came principally from the spawning area below the canyon, as the evidence now shows, this was inevitable.

A very interesting feature of the present contribution deals with another characteristic feature of the sockeye run to the Fraser in 1916. The total catch that year was the poorest

recorded. The run consisted in part of five-year fish from the brood-year 1911. The last named, 1911, was recorded in this Department's reports as the poorest year on the spawning-beds known up to that time. The year 1911 delivered a very small number of four-year fish to the run of 1915, and, as anticipated, it furnished an equally small five-year contingent in 1916. On the other hand, the season of 1912, from which as four-year-olds the greatest part of the run of 1916 was to be derived, was reported as unusually favourable, both as to numbers taken commercially, and also those observed on the upper spawning-grounds. The spawning area above the canyon was well seeded with the exception of the Shuswap section, but below the canyon the beds had less fish than had previously been reported. As the great majority of the off-year sockeye issue from the area below the canyon, the fact that the run there in 1912 was poor must have full consideration, as indicating that there would be a limited number of four-year fish in the 1916 run. Such was the fact. Ordinarily when one brood-year has been a partial failure, and has failed to deliver its component of a given run in customary abundance, the other component of that run, derived as it is from another brood-year, will be present in usual numbers and will partially save the situation. In 1916 both the four- and the five-year groups were far below their average, resulting in the poorest run on record.

The Skeena Runs.—It will be recalled, Dr. Gilbert states, that the 1916 catch of sockeye on the Skeena River was the poorest for the preceding decade, with the single exception of 1913. These two years—1916 and 1913—had to their credit respectively 60,293 and 52,927 cases. The smallest previous years of the decade had a catch of 87,901 cases, and the largest year, 187,246 cases. The average for the ten years, excluding 1913 and 1916, was 124,222 cases. Comparisons of this kind on the Skeena are not complicated, as they are on the Fraser, with the necessity of making allowance for increases in both kinds and amount of fishing-gear. For several years fishing conditions on the Skeena have been as nearly standardized as it is possible to make them. Conditions there give the best possible opportunity to estimate the number of salmon that can be safely spared from the Skeena run. If a tendency is shown for the packs to decrease, with other conditions remaining unchanged, no doubt can exist that the river is being overfished. In that case further restriction is called for and should be applied at once.

Dr. Gilbert has previously called attention to the difficulty of explaining the success or failure of a given year on the Skeena, on the basis of the amount packed four and five years previously. The same difficulty was met with in 1916. While the four-year fish descended from the apparently indifferent brood of 1912 with a pack of 92,498 cases, the five-year fish, which always constitute the most important element in the Skeena run, sprang from the brood-year 1911, when a pack of over 130,000 cases seemed to indicate an extensive run, and which was apparently confirmed in part by the reports from the spawning-grounds. Yet the 1911 contribution to the run of 1916 was only 36,554 cases. For comparison with this showing he cites the brood-year 1909. The catch that year was only 87,901 cases, yet five years thereafter the five-year fish of the 1909 brood contributed 97,623 cases to the pack of 1914. It is evident, therefore, that the amount of the pack on the Skeena River furnishes year by year an unsatisfactory indication of the size of the run. The year 1909 furnished not only 97,623 cases of five-year fish to the run of 1914, it had already given 26,463 cases of four-year fish to the catch of 1913. The total commercial yield from the 1909 brood was over 124,000, indicating that the year was one of high degree of success on the spawning-grounds. Commenting on a tabulation showing the Skeena sockeye-packs of six years and the combined packs of the brood-years, Dr. Gilbert points out that the three years having the largest pack also had the largest brood-years. If further statistics of this kind are in general reliable—it is much too early yet to make sure that they will be so—it may be possible to predict several years ahead with some degree of success. Commenting on the run for 1918, Dr. Gilbert says: "The pack of 1918 will have 1913 and 1914 for its brood-years, and their combined packs amount to 183,000 cases." If this has any significance, we can expect the pack of 1918 to fall at some point between 50,000 and 75,000 cases of sockeye. If, on the contrary, the pack turns out to be far larger than this, 100,000 cases or more, we would be compelled to admit that this method promises nothing in the way of useful forecast.

The Sockeye Runs to Rivers Inlet.—Turning to the runs of sockeye to Rivers Inlet, Dr. Gilbert again shows that the Rivers Inlet race exhibits a striking uniformity in comparison with the Fraser sockeye. No succession of recognizable forms appear here as in the Fraser. They appear to be a completely homogeneous assemblage. The reason is obviously to be found

in the simplicity of the Rivers Inlet basin. There is a simple short stream heading in a single large lake which is little above sea-level, and which has numerous short tributary streams. Here, evidently, the close similarity of external conditions, together with the close proximity of the spawning-grounds, favours a large percentage of strays passing from one bed to another, all of which tend to keep the race constant. For the present, Dr. Gilbert states, we have no evidence of the existence of distinguishing characteristics of the salmon populations seeking the different streams tributary to Owikeno Lake. But that fact does not prove that the Owikeno salmon fail to return to their own streams at spawning-time, as he points out.

In dealing with the unsatisfactory runs of sockeye to Rivers Inlet, in both 1916 and in 1917, Dr. Gilbert indicates the difficulty of adequately accounting for the light runs because of the lack of detailed reports from the spawning area in both 1911 and 1912, and such reports, he states, "give our best available basis for estimating future runs. It must be admitted that the breeding-grounds of Owikeno Lake are in an unsatisfactory and more or less precarious condition." Fishery Overseer Stone's reports for several years have called attention to log-jams which obstruct passage in some of the largest and finest of the areas for natural propagation. With unfavourable weather conditions, these jams might in any year effectively bar passage to salmon. It is not known to what extent the hatchery contributes to the annual supply or to what extent the run is dependent on natural spawning. No chances should be taken with the streams on the assumption that the hatchery operations are adequate. The tributaries should be promptly cleared of their obstruction, and where passages can be blasted over falls and large areas of good spawning-grounds be made available, that should be done. "The care of the spawning-beds is one of the most important and the most deplorably neglected branches of salmon-culture. It cannot," he concludes, "be stated that the alarming decline in two successive sockeye runs to Rivers Inlet is due to this cause, but the matter deserves immediate attention."

The Sockeye Runs to the Nass River.—In dealing with the runs of sockeye to the Nass River in 1916 and 1917, Dr. Gilbert calls attention to the fact that there have been fewer and less extensive fluctuations in the size of the runs in this river than in any other district in the Province. The average for the decade is 30,785 cases. In 1916 the Nass was up to its recent average with 31,411 cases, while the Fraser, Skeena, and Rivers Inlet agreed in having almost unprecedently poor runs. Not one of these three sections put up half a pack, and with the single exception of the year 1913 on the Skeena, the year 1916 was the worst in recent history. The Nass alone was unaffected in 1916. In 1917, however, the catch of sockeye on the Nass declined greatly, reaching only 22,188 cases. It was the worst year for the past decade. Dr. Gilbert can find nothing in the records to explain this decline. At the time he wrote he was ignorant of the catch of sockeye made, for the first time, by an American trap at the northern entrance of Portland Canal, and mentioned elsewhere in this report. The catch made there may explain the decline in the Nass catch.

One familiar with Dr. Gilbert's previous contributions to the Department's reports on the life-history of the sockeye salmon cannot help, on reading his present paper, being impressed by the thoroughness of his work and the great strides made in so complex a study. The present contribution furnishes much data that is of economic importance. It demonstrates in a practical way the value of such work in dealing with the questions of conservation and increase of our food-fishes, and is worthy of the closest study of those concerned in such work.

THE CRAB INVESTIGATION.

F. W. Weymouth, Assistant Professor of Physiology of Stanford University, continued during the year the investigation of the life of the Pacific edible crab and furnishes to the Appendix of this report his third contribution to its life-history. His previous paper contained certain general features of the life-history of the edible crab bearing directly on its distribution and the methods of fishing in the Province. The present adds materially to the account already given of the industry, and deals with the field-work of the Department in 1916 and 1917, especially that conducted at Boundary Bay; former studies having made it apparent that intensive work in a single locality was most likely to yield fruitful returns. The data obtained in 1916 and 1917 is the most complete yet made. He presents facts bearing on cooking and marketing—notably the so-called "light" and "black" crabs—that are of economic importance. There is new data on the relation of width to weight and the loss of weight in cooking, on the appearance of the larvæ, and consideration given to the cause of seasonal variation of the latter. In a later paper

Dr. Weymouth will submit consideration of certain questions of growth that have not gone far enough to permit of inclusion in the report.

The Native Oyster of British Columbia.

Dr. Joseph Stafford, of McGill University, contributes to the Appendix of this report a valuable contribution to the literature on "The Native Oyster of British Columbia," in which he points out that "the only way to turn the natural supply of oysters to almost limitless value as a natural asset is by artificial cultivation. We need not only to conserve the original stock, but to increase its productivity in order to keep pace with growing demands. The importance of method in oyster-culture can hardly be overestimated." Dr. Stafford treats at length the selection of location for growth, apparatus and construction work, purchase and raising seed, operations of culture, planting, separating, case, harvesting, and shipping. The manual is complete in every detail and affords the oyster-grower a hand-book of great value.

Reports from Salmon Spawning Areas.

During the season the Department, as usual, conducted an investigation of the spawning areas of the Fraser and Nass Rivers and Rivers and Smith Inlets. Detailed reports are attached hereto.

Spawning-grounds of Fraser River.—The investigation of conditions in the Fraser River watershed was again made by John P. Babcock, the Assistant to the Commissioner. His report discloses that the number of salmon which reached the spawning-grounds was far less than in any previous year in the cycle of big-year runs, and very little greater than in some lean years. In comparing conditions this year with those existing in 1913, the opinion is expressed "that the product of the spawning sockeye of this season will not produce a run in 1921 that is the equal in numbers of the run of this year."

The number of salmon that reached and passed through the narrow canyon of the Fraser above Yale was many times less than in 1913, and was little, if any, greater than in some lean years. Very few fish reached the canyon in July. The run was greatest in August, and few were in evidence later. The Indian fishery in that canyon caught 6,295 sockeye, 10,275 spring, and 550 cohoes. The fish all passed through the rapids at Hell's Gate. Indians fishing at the canyon of the Fraser above the mouth of Bridge River caught 11,730 sockeye and 817 spring salmon. Those fishing in the Chilcotin River caught 15,000 sockeye. Very few salmon passed up the Thompson River, with the result that the spawning-beds of Shuswap and Adams Lakes were poorly seeded. The number of sockeye that reached Quesnel is recorded at 26,246, as against 550,000 in 1913 and over 4,000,000 in 1909. The run in the Chilcotin River was little larger than in some recent lean years and very much less than in 1913. In 1909 several millions of sockeye passed through stream to spawn in Chilko Lake. The hatchery at Seton Lake was not operated because not to exceed 200 sockeye reached that section. The number of sockeye that reached Harrison-Lillooet Lake was very much less than in any former season of which there is a record. Summarizing the conditions, Mr. Babcock states: "Summary of the above shows that, notwithstanding increased efforts and use of gear on the fishing-grounds, stimulated by the highest prices yet paid for sockeye, the catch in the entire district, on both sides of the International Line, was 1,824,931 cases, or 76 per cent. less than in any preceding big year, and was little greater than in some lean years. The number of sockeye that reached the spawning area of the Fraser watershed, both above and below the canyon above Yale, was much less than in 1913, the year of the blockade, and little better than in some recent lean years. In comparing conditions this year with those of 1913, I am of the opinion that the number of sockeye which spawned in the Fraser watershed this year was much smaller, and was not sufficient to produce a run four years hence (1921) that will equal in numbers those caught this year."

Review of Conditions on the Spawning-beds of the Fraser River in Former Big Years.—So much importance is attached to the conditions on the spawning-beds of the watershed of the Fraser River in 1913, and again this year, that it is worth while to review the conditions on those beds in former years in the cycles when they were abundantly seeded. Notwithstanding that the catch of sockeye in 1905 did not equal that of 1901, there is evidence to show that the number of sockeye which spawned in the watershed in the former year was greater than in the latter. In 1901 very few of the sockeye which passed up the Quesnel River in millions were able to enter the lake owing to the fact that a practical fishway had not been placed on the

great dam at the head of the river. The vast number which passed up the Quesnel River in 1905 entered the lake through the fishway constructed by this Department in 1903, with the result that spawning-beds of Quesnel Lake and its tributaries were abundantly seeded. The number of sockeye which entered Quesnel Lake in 1909 was shown to have exceeded 4,000,000; while in 1913, owing to the blockade in the Fraser Canyon, approximately only 550,000 sockeye reached the spawning area of Quesnel Lake, and, as has already been stated, less than 28,000 sockeye reached the lake this year. The run to Chilko Lake in 1901, 1905, and 1909 was shown to have been as abundant as the run to the Quesnel River; while the run in 1913 was small and the Indians did not catch more fish than in 1912, which was a lean year. The run to this section this season is shown to have been very much less than in 1913.

Seton and Anderson Lakes were abundantly seeded in 1901, 1905, and 1909 in addition to natural propagation. In 1905 the hatchery at Seton Lake hatched 44,000,000 sockeye-eggs and in 1909 30,000,000. The run in 1909 compared favourably, although it did not equal the run of 1905. In 1913 the run to Seton and Anderson Lakes was estimated at 30,000, as against 1,000,000 in 1909; this season not to exceed 200 sockeye reached Seton Lake.

The spawning-beds of the many tributaries of Shuswap Lake were covered with vast numbers in 1901 and again in 1905 and 1909. There was no early run to this section in 1913, and the late run that season, which consisted of fish that had been assisted in passing the blockade, did not compare favourably with former big years. Very few sockeye reached this section this year. Since the spawning-beds of the Harrison-Lillooet Lakes section was not affected by the blockade, and the run to that section has not been notably larger than in the lean year, they are not included in this review.

The foregoing demonstrates clearly the effect of the blockade of 1913 upon the run of the big year. It destroyed it.

Rivers and Smith Inlets.—Fishery Overseer A. W. Stone again visited the spawning-beds of Owikeno Lake, at the head of Rivers Inlet, and also the spawning-beds of the salmon that run through Smith Inlet. He reports that the number of sockeye salmon that reached the spawning area of Owikeno Lake this year compared favourably with those seen there in 1913, 1914, and 1915, and greatly exceeded the run of 1916. Attention is called to the fact that following the early spawning the water fall in the district exceeded all previous records, and that the streams were in consequence higher than the Indians had previously known. This is held to have resulted in serious damage to the eggs already deposited and should be noted in estimating the run in the fourth and fifth year following. Overseer Stone calls attention to the log-jams in a number of tributary streams of Owikeno Lake that seriously interfere with the movements of spawning salmon. Conditions on the Wash Wash River described by him are serious. The river is so effectively blocked at its mouth that no salmon reach the extended beds of this stream. Other tributaries demand attention.

The reports upon the spawning-beds of the sockeye that pass through Smith Inlet show that, notwithstanding that the catch was smaller in the inlet than in 1916, the beds were much better seeded this year than last. The numbers found on the beds this year did not, however, compare favourably with those seen there in 1914 and 1915.

The Nass River.—Inspector of Fisheries C. P. Hickman again visited the accessible sockeye spawning area of the Nass River watershed during the spawning period. His report states that the number of sockeye that reached the Meziadin Lake section compared favourably with that of previous years, though not as large as in 1916. The great fishway at the falls in the Meziadin River was found to be in first-class condition.

J. McHugh, Engineer for the Dominion Fisheries Department, and a force of men went into the Meziadin with Inspector Hickman for the purpose of strengthening the retaining-wall above the left bank of the fishway. The work was satisfactorily accomplished. From reports and photographs it is evident that there is no longer danger of the channel of the fishway being filled with gravel.

THE DOMINION FISHERIES COMMISSION OF 1917.

During the past summer a Dominion Fisheries Commission sat in the Province to investigate and report upon certain matters in connection with the salmon-fishery and canning industry in the northern district of the Province.

The following specific questions were submitted by the Minister of Naval Service, who directs the fishery service of the Federal Government:—

"(1.) Whether the number of salmon-canneries allowed to be operated in District No. 2 (the north district), British Columbia, should be restricted to the number of licences for such establishments as are now effective; and, if so, for what length of time?

"(2.) Whether motor-boats should be allowed to be used in salmon-fishing operations in said district?

"(3.) Whether the number of fishing-boats to be used in any area should be enlarged or reduced (*a*) if motor-boats are allowed, and (*b*) if rowboats only be permitted; and, if so, by how many in either case and in either direction?

"(4.) Whether any of the boats authorized to be used in any area should be licensed to fish in connection with specific canneries only; and, if so, what proportion of such boats?

"(5.) Whether the export, in a fresh condition, of other varieties of salmon than sockeye should be prohibited; and, if so, to what extent?"

The Department is in receipt of an advanced copy of the comprehensive and valuable report made by the Commission. The report deals with "The General Standpoint of the Inquiry," brief notes on the "Nature and Habits of Pacific Salmon," "The Supply of Salmon," "The Canning Industry," "Fishery Administration," "Position of the Province of British Columbia," and answers the questions specifically referred to the Board. The report contains many diagrams to sustain its arguments, that are original, readily grasped, and valuable to fishermen and canners. It is a very strong and able paper.

The Commissioners find that there are more canneries in the northern district than are required to deal with the fluctuating supply of salmon. It is shown that the canneries on the Skeena and Nass Rivers and Rivers Inlet in 1916 could have put up the entire pack in less than nine days of twelve hours each, thus indicating overequipment. It is shown that thirty-three canneries in the north have a fixed investment of $3,492,000, and that if borrowings of working capital were taken into account the turnover appears less than the capital employed.

"The most general of all the determining conditions," the Commissioners state, "is that which arises from the necessity of conserving the supply of salmon. If enough fish are to be allowed to pass up the rivers to seed the spawning-beds, then only a certain number of fish can be allowed to be caught. Restriction is now imposed in various ways and the public must insist on fixing some limit to the catch. If equipment becomes too great, either because new canneries are built or because the plants in existence are enlarged, it is not within the power of the canners by any enterprise or industry to correspondingly increase the supply of material. One canner may take business from another canner, but the industry as a whole must face diminished efficiency with its rapid rise in costs."

"It is," in the judgment of the Commissioners, "a clear public duty, not merely to conserve the supply of salmon at its present proportion, but to increase it until each year reaches the economic maximum; and it appears to us equally clear that all the conditions surrounding the industry should as far as possible be stabilized, and the inefficient use of capital and labour obviated or prevented. The solution of this problem would not seem to be found in encouraging or permitting the employment of more capital or more labour than can efficiently perform the work. The public interest can be better served in other ways. The privilege enjoyed by those who fish in tidal waters is not only fundamentally a public right, but the public stands related to the industry as taxpayers and as consumers. If the cost of production becomes too great, all hope of advantage to the public as consumers will disappear."

In recommending further limitations in the canning industry, the Commissioners state that they do so upon "the condition that excessive profits, if any, shall go to the public, and that exploitation, as a fact and as a motive, shall be eliminated from the industry."

The report is well worth the study of those interested in the salmon industry and the general public as well. It adds force to the arguments in support of the need of conservation of the salmon-supply and the position taken by this Department on the questions at issue.

The Commissioners made the following replies to the questions submitted:—

"(1.) That the number of cannery licences be not increased for a period, for five years.

"(2.) Recommended that, under existing conditions, the prohibition of motor-boats in gill-net fishing in District No. 2 be continued for a period of five years.

"(3.) Recommended that there be no increase in the number of boats allowed. If motor-boats are allowed, we recommend a material reduction in the present boat-rating.

"(4.) Recommended that only one form of salmon gill-net licence be issued, and that competence as a fisherman be established as a qualification for a licence. For two reasons, however, we recommend that the new system under this head be not put into effect until the season of 1919.

"(5.) While convinced that the situation in which the above question has been raised has serious aspects, we are not prepared, under existing conditions, to recommend that export be prohibited."

In each of the above finding, except the last one, the Commissioners sustain the position taken by this Department in its correspondence with the Minister in Ottawa, protesting against the adoption of the regulations issued in January, 1917.

The following statement of the salmon-eggs placed in the hatcheries of the Province is furnished by Lieut.-Colonel F. H. Cunningham, Chief Inspector of Fisheries for the Dominion:—

STATEMENT SHOWING THE NUMBER OF SALMON-EGGS COLLECTED FOR THE HATCHERIES IN THE PROVINCE FOR THE YEAR 1917.

Hatchery.	Sockeye.	Spring.	Cohoe.	Pinks.	Chums.	
						Skeena River Watershed.
Babine Lake	9,000,000	...	...	...	...	13,450,000 sockeyes.
Skeena River	4,450,000	...	...	...	...	
						Rivers Inlet Watershed.
Rivers Inlet	14,784,000	...	...	...	...	14,784,000 sockeyes.
						Vancouver Island Watershed.
Anderson Lake	2,095,000	...	213,000	...	...	3,180,000 sockeyes. 1,344,000 springs. 1,585,400 cohoes. 6,109,400 total.
Kennedy Lake	1,085,000	...	84,700	...	...	
Cowichan Lake	...	1,344,000	1,287,700	...	...	
						Fraser River Watershed.
Pemberton	5,270,000	30,000	740,000	...	...	31,004,000 sockeyes. 1,828,000 springs. 2,191,000 cohoes. 5,320,000 pinks. 5,840,000 chums. 46,183,000 total.
Harrison Lake and subsid. hatcheries	25,734,000	1,798,000	539,000	5,320,000	5,840,000	
New Westminster	...	...	912,000	...	...	
Totals	62,418,000	3,172,000	3,776,400	5,320,000	5,840,000	

Total salmon-eggs collected, 80,526,400.

The Sockeye Salmon-pack* of the Fraser River District from 1900 to 1917, inclusive.

Year.	Fraser River.	Puget Sound.	Totals.
1900	229,800	228,704	458,504
1901	928,669	1,105,096	2,033,765
1902	293,477	339,556	633,033
1903	204,809	167,211	372,020
1904	72,688	123,419	196,107
1905	837,489	847,122	1,684,611
1906	183,007	182,241	365,248
1907	62,617	96,974	159,591
1908	74,574	155,218	229,792
1909	585,435	1,005,120	1,590,555
1910	150,432	234,437	384,869
1911	62,817	126,950	189,767
1912	123,879	183,896	307,775
1913	736,661	1,664,827	2,401,488
1914	198,183	336,251	534,434
1915	91,130	64,584	155,714
1916	27,394	78,476	105,870
1917	148,164	411,538	559,732

* Given in cases—forty-eight 1-lb. cans to case.

Sockeye Egg-take at Fraser River Hatcheries from 1901 to 1917.

1901	15,741,000
1902	72,034,000
1903	13,464,000
1904	9,469,000
1905	97,656,000
1906	51,121,000
1907	53,952,000
1908	46,709,000
1909	98,000,000
1910	37,343,000
1911	22,937,000
1912	38,500,000
1913	86,000,000
1914	28,589,000
1915	68,476,000
1916	40,203,000
1917	31,004,000

APPENDICES.

THE FISH-GROUNDS AND THE SPAWNING-BEDS OF THE FRASER RIVER.

Hon. H. C. Brewster,
Commissioner of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit that during the season I thoroughly inspected the salmon fishing and spawning grounds of the Fraser River. As is well known locally, this was a year in which there should have been a big run of sockeye and pink salmon to the Fraser. It is also known locally that the run of sockeye and pink salmon to the Fraser this season was the poorest "big year" run ever recorded, and that it was little better than during some recent lean years. The total catch of sockeye in Provincial waters of the Fraser River District produced a pack of 148,164 cases, as against 719,796 cases in the previous big year, 1913; a decrease of 571,632 cases. Notwithstanding that 1917 was the year for the big run to the Fraser, the catch in the Provincial waters of the district did not equal that of 1914, a lean year.

The catch of sockeye in the State of Washington waters, through which they pass to reach the Fraser, produced a pack of 411,538 cases, as against 1,664,837 cases in the previous fourth year, 1913; a decrease of 1,252,299 cases. The total decrease for the entire Fraser River District therefore being 1,824,931 cases, or 76 per cent. less than that of the fourth preceding year.

This remarkable decline in the catch of sockeye was due to a small run, and not to a failure to catch the fish. This is demonstrated by the small number which reached the spawning-beds, as well as by the fact that the number of fishermen and the amount of gear engaged on both sides of the International Line was greater than in 1913. In the Provincial waters of the Fraser River District 2,606 gill-nets were operated in the Gulf of Georgia and the channels of the Fraser and seven traps in Juan de Fuca Strait. In the State of Washington waters of the district licences were issued for 274 traps, 411 purse-seines, and 394 gill-nets.

The decrease in the run of sockeye to the Fraser this season is attributable to the blockade in the channel of the river at Hell's Gate during the spawning migration of 1913, in consequence of which the fish were unable to reach the spawning-grounds. During the construction of the Canadian Northern Pacific Railway through the canyon of the Fraser such great quantities of rock were thrown into the narrow channel of the river as to make it impassable, during certain stages of water, to the salmon. My report for the year 1913 dealt extensively with conditions in the canyon in the summer and fall of that year. The following summary from page 37 of that report tells the story sufficiently for the purpose of this report:—

"I feel fully justified from my investigations in concluding that the number of sockeye which passed above the fishing limits was as great this year as any preceding big run of which we have a record, and I think even greater. The sockeye made their appearance in the canyon above Yale in June, and during the high waters of that month and July large numbers passed through to Quesnel and Chilko Lakes. The great proportion of the run of sockeye in late July and in August and September were blockaded in the canyon by rock-obstructions placed in the channel, incident to the construction of the Canadian Northern Pacific Railroad, so that few were able to pass through during that time. No humpbacks succeeded in passing through the canyon. The blasting of temporary passage-ways enabled a large proportion of the sockeye run of October and November to pass through the canyon. Sockeye were seen drifting down-stream, between Hell's Gate and Yale, in August; the movement was very pronounced in September, and continued until the middle of October. The streams which enter the Fraser between Hell's Gate and Agassiz were filled with sockeye from the middle of August until the end of October, while they had not been observed in those streams in previous years. Very few sockeye spawned in any of these streams, and most of them died without spawning. Great numbers of dead sockeye, which had died without spawning, were found on the bars and banks of the Fraser between Yale and Agassiz in September and October. The number which reached Quesnel Lake was little more than one-eighth of the number which entered that lake in 1909. The run to Chilko Lake was equally small. The sockeye run to Seton Lake was 30,000, as against 1,000,000

in 1909. The August and September run of sockeye to Shuswap and Adams Lakes was much less than in any former big year, and the October and November run was also less. The sockeye-eggs collected there this year totalled but 9,000,000, as against 27,500,000 four years ago and 18,000,000 in 1905. The run to Lillooet Lake was less than in any recent year. Finally, the run to Harrison Lake was slightly better than in 1909.

"These facts, in my opinion, warrant the conclusion that the number of sockeye which spawned in the Fraser River watershed this year was not sufficient to make the run four years hence even approximate the runs of either 1905, 1909, or 1913."

Fishing Season in Provincial Waters of Fraser District.

The first sockeye caught in the Fraser District this season were taken in the traps on the south shore of Vancouver Island on July 14th. Catches continued for a month. The fish taken up to July 21st consisted largely of sockeye that averaged little over 22½ inches in length, and were apparently different from the average school that runs to the Fraser. From July 23rd to August 6th the sockeye averaged 24 inches in length. From the latter date until the end of the run they averaged 25 inches in length. The catches from July 23rd until the end of the season were of the typical Fraser run of sockeye.

The catches in the State of Washington waters and in the Gulf of Georgia and Fraser River proper in the early part of the season exceeded the catches made at the same period in 1913, and were the largest made during the season. The early catches were so much larger than at the corresponding time in 1913 that some fishermen and canners inferred that the run this year would equal that of former big years. However, the catches throughout August were small, did not approach that of former big years, and, in fact, were little larger than in some lean years.

The price paid the fishermen at the opening of the season was 40 cents per sockeye, was soon advanced to 50 cents, and later reached as high as 75 cents; very much higher prices than had been paid in previous seasons.

There was no pronounced late run of sockeye to the Fraser this year, as was the case in the fall of 1905, 1909, and 1913.

The run of pink salmon to the Fraser River this season was smaller than that of 1915, the last preceding year of their run to that stream. The catch of pink in the traps on the south shore of Vancouver Island and in the waters of the State of Washington was large, but the catches in the Gulf of Georgia and in the Fraser River proper were small; indicating, I believe, that the catches made by the traps in the straits and by the traps and purse-seines in the sound consisted of fish that were not bred in or running to the Fraser. It is well known that pink salmon propagate in all the streams tributary to Puget Sound.

The catches of pinks in the Gulf of Georgia and Fraser produced a pack of 134,442 cases, a few thousand cases less than in 1915, the previous year of their run to the Fraser. The price paid for pinks was many times greater than in 1915, and the efforts made to catch the fish were far more extensive. It will be recalled that there was a big run of pinks in 1913 and that vast numbers appeared in the canyon of the Fraser, at Hell's Gate, and were prevented from passing through that canyon by the blockade which so fatally obstructed the run of sockeye. No pinks passed through the canyon in 1913 and none were observed there in 1915.

Conditions on the Spawning-grounds.

I again personally inspected the principal spawning area of the Fraser River watershed, and was assisted by Inspector of Fisheries Hickman and Fishery Overseer Newcombe. As a result of our observations I have to submit the opinion that the number of sockeye which reached all sections of that vast watershed this season was very much less than in the former big year (1913), and did not, in most sections, exceed those observed there in 1912, a lean year. In comparing conditions this year with those existing in 1913, I am of the opinion that the product of the spawning sockeye of this season will not produce a run in 1921 that will equal in number the run of this year.

The number of salmon that reached and passed through the narrow canyon of the Fraser above Yale this year was many times less than in 1913, and was little, if any, greater than in some lean years. The average water conditions throughout the summer and fall were favourable for the passage of salmon through the rapids in the canyon. There were short periods this year, as in former seasons previous to the slide in 1913, during which the salmon had considerable

difficulty in getting through the rapids at Hell's Gate, but all eventually passed through en route to the spawning area above. They experienced no difficulty at the Scuzzy. During most of the time the fish were running they passed through Hell's Gate by hugging the rock wall on the right bank of the stream. Throughout the season few were able to pass the rapid on the left side of the canyon. At no time this year did the fish have more difficulty in navigating this rapid than those in the runs previous to the blockade of 1913. The channel of the river at this point has been fully restored. Very few fish reached the canyon until the latter part of July. The run was heaviest in August, and was very poor thereafter. The great numbers of sockeye noted in this canyon in October and November of the years 1905, 1909, and 1913 were not in evidence this year. Only a small number were to be seen there in either of those months.

Chief Inspector of Fisheries for the Dominion, Lieut.-Colonel F. H. Cunningham, advises me that Special Fishery Guardian Thomas E. Scott, who was stationed in the canyon throughout the season, reported that the Indians in the vicinity of Hell's Gate caught and dried 6,295 sockeye, 10,275 spring, 550 cohoe, and 105 pink salmon during the summer and fall. After the spring salmon began to run in August the Indians ceased catching sockeye. They prefer the spring salmon for drying, and as they use a larger-mesh net to catch spring than that used to take sockeye, the latter have no difficulty in passing through it and are not captured.

The Run through the Canyon above Bridge River.

I am also informed by the Chief Inspector of Fisheries that Special Guardian Wm. J. Smith, who was stationed at the canyon of the Fraser above the mouth of Bridge River, north of the town of Lillooet, reports that the Indians who fished there caught and dried 11,730 sockeye and 817 spring this year. The salmon which reach this canyon are en route to Quesnel and Chilko Lakes and the smaller lake-fed streams to the north. They have much less difficulty in navigating these rapids than those at Hell's Gate. During high water they experience no difficulty, and do not expose themselves to the Indians, and therefore few are taken. During medium stages of water the Indians successfully fish for them with dip-nets and gaffs from both banks. At times of low water the fish mainly travel along the rock wall on the left bank and few of them get by the Indians. During low water the Indians have no difficulty in intercepting the greater proportion of the fish which attempt to pass. In former big-year runs the catch of the Indians fishing in this canyon averaged approximately 40,000 sockeye. In 1913 they caught 10,000; in 1914, a lean year, they caught close to 20,000 sockeye. Water conditions this year were much more favourable to the method of fishing in vogue than those of 1913. It will be recalled that the main run in that year passed through both Hell's Gate and Bridge River Canyons during extreme high water in July.

No pink salmon were observed or captured at the Bridge River Canyon this year. None were taken there in 1913 or 1915. Previous to 1913 pink salmon in vast numbers were observed at this point every year of their run in the Fraser.

The Run on the Thompson River.

The number of sockeye and spring salmon that passed up the Thompson River this season was so small that the Indians living in the vicinity did not at any time catch a sufficient number to dry any. Repeated inspection of the river failed to disclose any salmon. Previous to 1913 vast numbers of sockeye passed up this the main tributary of the Fraser every year of the big run in order to reach the spawning area of Shuswap and Adams Lakes. In 1913 the early run in the Thompson was very small, and the August and September run, though notable, did not reach the proportions of any former big year. There was no October or November run this year.

No pink salmon were observed in the Thompson or any of its tributaries this season. Previous to the blockade in 1913 many millions of pink salmon passed up the Thompson every other year and spawned on its gravel reaches or entered its tributaries. The bed of the Nicola, the principal tributary of the Thompson, from its source to its mouth was literally paved with pink salmon every other year. Pink salmon were unable to get through the rapids at Hell's Gate in 1913. None have been noticed in the Nicola since 1911, or at any other point above the canyon at Hell's Gate.

Quesnel Lake.

The first sockeye made their appearance at the entrance of Quesnel Lake on August 14th, fourteen days later than in the former big year (1913) and on the corresponding date in 1909.

Very few reached the lake until the 23rd. Up to that date less than 400 entered the lake. The run was heaviest between August 23rd and 29th. During that period over 11,000 passed through the fishway. From August 31st to September 3rd the run was very light. There was a noticeable increase on September 4th, which continued up to the 8th. Close to 10,000 fish entered the lake between those dates. The run ceased on the 12th. The number which passed through the fishway into the lake, as all must do that enter it, this season totalled 26,246, as against 552,000 in 1913 and 4,000,000 in 1909.

All the salmon which enter Quesnel Lake pass through the wide fishway which the Provincial Government constructed in the race of the great dam at the lake's outlet in 1903. Every year since the fishway was constructed this Department has maintained a watchman at the dam during the run of salmon in order to protect the fish and to record the size and duration of the run. Fishery Overseer Newcombe was stationed there this season. He recorded daily the number of sockeye which passed through the fishway. The following is his record for the season:—

Record of the Approximate Number of Salmon which entered Quesnel Lake during Season of 1917.

Date.	Number per Day.	Date.	Number per Day.
August 14	12	September 1	0
„ 18	3	„ 2	1,200
„ 19	1	„ 3	240
„ 20	20	„ 4	1,500
„ 21	120	„ 5	3,120
„ 22	168	„ 6	2,346
„ 23	576	„ 7	1,300
„ 24	2,184	„ 8	840
„ 25	3,792	„ 9	216
„ 26	24	„ 10	620
„ 27	2,880	„ 11	288
„ 28	2,780	„ 12	100
„ 29	620		
„ 30	1,200		
„ 31	96		
Total	14,476	Total	11,770

Total in August	14,476
Total in September	11,770
Total for season	26,246

During the run this season the water in the race was 4 feet higher than usual. The overflow from the lake during the past season was the greatest recorded there since the dam was constructed in 1898. During the early summer flood the apron at the lower end of the raceway of the dam was carried away. That did not, however, interfere with the salmon entering the fishway. The entrance was constructed to meet just such a contingency. Throughout the season, as usual, the fish had no difficulty in entering the fishway and passing through into the lake.

Chilcotin River and Chilko Lake.

The number of sockeye which entered the Chilcotin River, en route to Chilko Lake, this season was little larger than in some recent lean years, and far less than in 1913, when the run was blocked at Hell's Gate. The first sockeye made their appearance in the Chilcotin on August 9th, somewhat later than usual. Few were taken by the Indians before August 20th. Between that date and September 5th the Indians fishing at Fish Canyon, a few miles above the junction of the Chilcotin and Fraser Rivers, caught and smoked approximately 10,000 sockeye. There was no run after the latter date. The Indians fishing near Hanceville did not catch nearly as many as were taken at Fish Canyon. Those at Indian Bridge, on the Chilko River proper, caught very few. The Indians' total catch from the Chilcotin and Chilko during the season did not exceed 15,000, as against 25,000 in 1913. I did not visit Chilko Lake this

year because the small numbers caught by the Indians at their three principal fishing-stations indicated a small run, and because their chief advised me that the Indians at the outlet of the lake had told him that there were very few sockeye there, and said that "they had not caught enough to smoke any of them."

It is well known by those familiar with the watershed of the Fraser that up to 1913 vast numbers of sockeye ran in the Chilko River every year of the big run. Chilko Lake, at the head of that river, affords one of the best and most extensive spawning areas in that watershed. I have been familiar with conditions there since 1903. The extent of the run of sockeye in the big years previous to 1913 will be best understood by reference to my report for 1909. In the latter year the beds of the river's channel for ten miles below the lake was entirely covered with sockeye. I have never seen such vast numbers of salmon in any unobstructed stream as I saw there in 1909. In point of numbers they equalled those seen in the Fraser for a mile below Hell's Gate during the blockade of 1913. The catches made by the Indians in the Chilcotin River, at almost every stage of water, may safely be taken as strongly indicative of the extent of the run to that stream. The fact that the Indians this year did not take to exceed 15,000 sockeye, as against 25,000 in 1913, indicates that the run this year was very much less than in that year, and little, if any, better than it was in 1912, a lean year.

SETON LAKE.

Not to exceed 200 sockeye reached Seton Lake this year. Following the custom of former years, weirs were placed at the outlet of the lake early in August for the purpose of retaining the fish in order to collect their eggs for the hatchery. A few fish entered the weir the latter part of September and a few others in October. At no time were there sufficient numbers to justify taking their eggs for hatchery propagation. The fish spawned naturally. The hatchery was not operated during the season.

There was no run of pink salmon to Seton Lake this fall. Up to 1913 pink salmon reached there is vast numbers every second year. They run in the Fraser only in alternate years. In consequence of the blockade on the Fraser in 1913 the run of pink salmon of that year did not extend to any waters above, and the beds were therefore unseeded. No pinks reached Seton Lake in 1915.

During the season of 1915 the Department collected some 6,000,000 of pink-salmon eggs from the Mamquam river, near Squamish, at the head of Howe Sound, and shipped and hatched them at the Seton Lake Hatchery. The young fish were liberated in the stream flowing from Seton Lake. They were free-swimming and strong fish. They at once began, as was natural, their migration to the sea. It was fully expected that such as escaped destruction in the sea, capture on the fishery-grounds, and re-entered the Fraser would reach Seton Lake this year, but none did so. And, as has already been stated, no pink salmon have been seen above the canyon of the Fraser since 1911.

SHUSWAP AND ADAMS LAKES.

Only a very small number of sockeye salmon reached Shuswap and Adams Lakes this year. At no time this season were they nearly as numerous as in the fall of 1913. The first reached there the last week in August. The greatest numbers were found in the streams in September. As in 1913, very few appear to have reached Eagle or Salmon River. They were more numerous in the Lower Adams River than in any other section, but the numbers seen there did not compare favourably with the poor run of 1913.

The number which entered Adams Lake was so small as to give no promise of assistance to the run of 1921.

Up to 1913 there had not been recorded a poor big-year run to either Adams or Shuswap Lakes. In 1901, 1905, and 1909 every one of the many large tributaries of Shuswap Lake was crowded with spawning sockeye from August until the end of October. It will be recalled that the early run of sockeye in 1913 was small, and that the fall run was large only in the Lower Adams River. From observations made in 1913, and again this year, it appears that the run to this section was more nearly exterminated by the blockade of 1913 than that to Quesnel or Chilko Lakes.

Harrison-Lillooet Lakes Section.

The number of sockeye that reached the Harrison-Lillooet Lakes section this year was very much less than in any season of which there is a record. The hatchery on the Birkenhead River, at the head of Lillooet Lake, collected but 5,270,000 sockeye-eggs, as against 25,000,000 in 1913 and 27,000,000 in 1909. The last two mentioned years were years of a big run to the Fraser. The collections this year were the smallest yet made at the hatchery. In 1914, 15,220,000 sockeye-eggs were taken; in 1915, 25,000,000; and in 1916, 25,750,000. It will be recalled that the Lillooet-Harrison Lakes contribute to the Fraser through Harrison River, some sixty-five miles below the canyon at Hell's Gate, and consequently the small run this year to this district was not affected by the blockade of 1913, and cannot therefore be attributed to the effect of that obstruction.

As a result of my study of conditions in the Fraser watershed since 1901, I am of the opinion that the runs of the lean years have mainly consisted of sockeye hatched in the Harrison-Lillooet Lakes section. The number of fish propagated in that section does not appear to have been larger in the years of a big run to the Fraser than in the lean years. The run of the big year, up to this year, I am of the opinion, have been largely the result of the seeding of the spawning area above the Fraser Canyon, above Yale.

The run of sockeye this year to Harrison Lake and its tributaries was apparently the smallest ever recorded there. The number that sought Cultus Lake, and the subsidiary egg-collecting station of the Harrison Lake Hatchery, was in the main satisfactory. A total of 25,734,000 sockeye, 5,320 pink, and 5,840,000 chum eggs were collected for the hatchery, as will be noted from the statement furnished by Lieut.-Colonel Cunningham, Dominion Chief Inspector of Fisheries, which appears on page 18.

Summary of Conditions on Fishing and Spawning Grounds of the Fraser.

A summary of the above shows that, notwithstanding increased effort and use of gear on the fishing-grounds, stimulated by the highest price yet paid for sockeye, the catch in the entire district, on both sides of the International Line, was only 1,824,931 cases, or 76 per cent. less than in the preceding big year, and was little greater than in some lean years. The number of sockeye that reached the spawning area of the Fraser watershed, both above and below the canyon above Yale, was very much less than that in 1913, the year of the blockade, and little better than in some recent lean years.

A comparison of conditions existing this year with those of 1913 leads me to express the opinion that the number of sockeye which spawned in the Fraser watershed this year was much smaller, and was not sufficient to produce a run four years hence that will equal in numbers those caught this year.

I have, etc.,

John Pease Babcock,

Assistant to the Commissioner.

Victoria, B.C., December 31st, 1917.

THE SPAWNING-BEDS OF RIVERS INLET.

Hon. H. C. Brewster,
Commissioner of Fisheries, Victoria, B.C.

Sir,—The investigation of the Rivers Inlet watershed was undertaken on the completion of the inspection of the spawning-grounds at Smith Inlet, and I have the honour to submit herewith my report upon the conditions of these grounds.

The Owikeno Lake ten or twelve days prior to my visit experienced one of the worst rain-storms, and rose higher than has been known for many years, even by the Indians. The result may have caused considerable harm to the spawning-grounds, especially in the early-running streams, and should be carefully noted when making the inspection four or five years hence. The lake had receded to the normal on the occasion of my visit, and I was able to form an accurate opinion of the conditions of this watershed.

Leaving Rivers Inlet Cannery on October 13th, I proceeded to the head of the lake direct, as it is at this point the sockeye salmon commence to make early use of the spawning-beds, and on arrival I found that the few sockeye seen were all spawned out.

The Indian River was absolutely bare of any sign of the fish from the entrance right up to the falls. The conditions of the river-bank showed plainly the effects of the recent heavy rain and had left its mark 20 feet above the original level of the river. In conversation later with one of the hatcherymen, who had visited this point during the latter part of September, I was informed the rivers—the Cheo, Indian, and Washwash—were well stocked with sockeye salmon and could be seen in thousands spawning on the beds. It is to be feared, therefore, the freshet must have had serious effects upon the spawning salmon, unless the deposit of spawn had been safely completed before the full effects from this danger was felt. No log-jams obstructed the river, which was absolutely clear, and provided an ideal spawning-ground for the salmon. I was unfortunately unable to obtain either specimen eggs or scales from this river.

The Cheo had received very rough treatment from the exceptional weather; huge trees had been thrown across the river, evidently uprooted by the freshet pouring over the banks, and on arriving at the bend about three miles and a half from the mouth I noticed the log-jam, which had been accumulating in size during the past five years, completely blocked the passage of any salmon passing through to the upper reaches. This, however, causes little inconvenience at present, as most of the spawning-grounds are situated below the obstruction. It will be necessary to have this removed, in the event of the falls receiving attention from the Department, to erect a fish-ladder or provide a passage through the falls to enable the salmon to reach the fine spawning-grounds above; otherwise the small area of spawning-ground lying between the log-jam and the falls will hardly repay the outlay involved in removing this obstruction. No sign of sockeye salmon were noted on my way up the rapids. The small streams emptying into the river, however, contained a few spawned-out sockeye from which specimen scales were obtained. It is to be feared serious consequences will have attended the result of the freshet here unless the salmon had already succeeded in seeding the beds.

The spectacle presented by a view of the Washwash was anything but favourable. The log-jam obstructing the mouth, to which I had drawn attention in previous reports, recommending its removal, or in time would completely block the passage to the salmon, I found had effected its purpose. No salmon are able to pass through. The large number of salmon reported on the beds during the latter part of September is encouraging, as it proves the sockeye were able to reach the upper portion of the stream and deposit the spawn before the full effects of the freshet was felt. An examination of the river here bore conclusive evidence of the ravages of the rain-storm. New channels had been formed, and gravel-bars thrown up which will bear little fruit even if the sockeye spawned on them, as they remain dry except at rare intervals. Very few sockeye salmon were encountered and all appeared to be spawned out, with the result that only specimen scales were obtained. The bears evidently found great difficulty in supplying their wants and had recourse to digging the dead salmon up from the beach. I was able to witness them at this operation, coming unexpectedly on two big fellows as we dropped quietly down the river in the canoe.

Returning from the head of the lake, I paid a visit to Sunday Creek, which was only with extreme difficulty recognized. The effects of the wash-out completely obliterated the original creek. A new channel having been formed on the left, composed principally of rocks and pebbles, will provide very poor spawning-ground to the large number of sockeye seen swimming around at the mouth.

Along the beach at this point a small stretch of good spawning-beds enabled the salmon to make up for the indifferent grounds inside, and the favourable number seen, as compared with last year, should result in large numbers of sockeye seeking this tributary from this season's spawning. The sockeye were exceptionally fine fish.

The fine spawning-beds at the Narrows were plentifully supplied with salmon, and should produce their full quota of eggs. Sockeye were observed breaking water frequently, and where the beds could be seen in the shallow water large numbers were in evidence.

The freshet did not appear to have affected the Sheemahant River to any great extent; beyond log-jams which had formed at the entrance and at various points on the way up, no obstructions were observed to interfere with the passage of the salmon.

Large numbers were spawning on the riffles right up to the falls, eighteen miles distant, and came well up to the average of the 1913, 1914, and 1915 runs. Exceptionally fine specimens hooked out of the river at random testified to the fine average in size the salmon run is to this point this year. Cohoe salmon were in evidence at the falls, and making desperate efforts to surmount them, but of no avail. The marked improvement in the run over last year is shown up in glaring fashion. No difficulty was experienced in obtaining both salmon scales and spawn, which was added to the collection I am making from all the streams.

Arriving at Jeneesee Creek on October 24th, I found conditions distinctly favourable; the sockeye salmon were very much in evidence, and reminded me of the big runs here in 1913 and 1914.

A few boxes of eggs had been filled by the hatchery officials, but the salmon were not yet in a sufficiently ripe state for spawning. Captain Hames, Superintendent of the Dominion Hatchery, whom I met at this camp, seemed well satisfied that a large number of eggs would eventually be collected from this creek, and his prophecy was later borne out, so I am given to understand. A big run of sockeye entered later, and permitted the hatcherymen to obtain all the eggs required from this stream. The sockeye compared in size with the 1913 run, bearing a very much lower average in comparison with the runs here in 1914, 1915, and 1916.

The obstructions in the creek above the fence require cleaning out if the salmon are to receive full advantage from the spawning-beds available here; at present the log-jams are scattered all over the creek right up to the falls, one mile and a half distant, and gives little opportunity for the salmon to deposit their oval after the requirements of the hatchery have been filled.

The Nookins, an early-running salmon-stream branching off from the Machmell, had already received its supply of sockeye salmon, having arrived three weeks prior to my visit. The Indians were able to inform me, however, that the beds were fully stocked, and came well up to the average of the runs seen here in 1913, 1914, and 1915. There were few sockeye spawning on the beds as we proceeded up the river, but ample evidence that the run had been an exceptionally big one was shown by the number of dead bodies lying in the lower reaches. An examination made of a number of these fish, which were hooked out of the river, revealed no sign of belonging to a later run; they were all in an advanced stage of spawning; this fact did not preclude me from making a collection of eggs or from obtaining specimen scales of the fish. The salmon were able to make full use of these grounds without hindrance from log-jams or other obstacles. One jam which could with advantage be cleared lies about two miles from the entrance. The size of the sockeye did not appear to show up in comparison with the past three years.

The Machmell River, to which attention was given next, afforded little opportunity to view the spawning-grounds satisfactorily, owing to the thick muddy condition of the water. An exceptionally big river, and resembling the Sheemahant in size, it evidently offers little attraction to the sockeye, who prefer the Nookins, a tributary, and to which reference has already been made. Few salmon were observed as we proceeded up the river to the canyon. On one occasion only has it been possible with any degree of certainty to obtain a favourable survey of the spawning-grounds; this was in 1914, when the low state of the river permitted me to examine them thoroughly. In that year a favourable impression was formed; large numbers of sockeye were in evidence.

The reputation of the Asklum River was well maintained, and although a little late in making the inspection here, the number of sockeye salmon spawning on the beds in the upper reaches came well up to the average of the runs of 1913, 1914, and 1915. They were in an advanced stage of spawning, and large numbers were observed lying dead. It was again noted here that the sockeye did not approach in size the runs of the past three years. There are one or two log-jams obstructing the course of this river, but do not interfere with the passage of the salmon up-stream; these could be removed with advantage. The recent freshet had forced a new channel, through which many of the sockeye passed on their way to the main river above; others were observed spawning in the channel itself. A collection of both scales and eggs were obtained from this stream.

Arriving at Quap River, I was impressed with the favourable conditions here. It was an inspiring sight to watch the thousands of sockeye crowding the river to the hatchery fence, and it was evident no difficulty would be experienced in obtaining all the eggs necessary to fill the hatchery, providing, of course, no unforeseen event happened to upset calculations. The experi-

ence of 1915 may well have been repeated had the recent freshet occurred a little later; when in that year the river rose during a rain-storm, and not only partly destroyed the hatchery fence, but rose above it, and allowed thousands of salmon waiting there to reach the spawning-beds above; this year fortunately the salmon were not ready to enter the river and consequently missed their opportunity, much to the relief of the hatchery officials. The obstructions all along the river are still very much in evidence, no attempt having been made so far to have them removed; this, however, does not seem to have affected the run here, as the very high average maintained year by year proves. It is no doubt due to the care taken by the hatchery to restock the river each year. In size the salmon were below the average. I am informed, in the interval of writing, that another big run of sockeye had entered this river; therefore no doubt need be entertained that the high average of the 1913, 1914, and 1915 runs will be repeated this year.

Crossing to the Dalley River, another early-running salmon-stream, and exceptionally well adapted for the propagation of spawn, I was pleased to see a great improvement over last year in the number of salmon spawning on the beds. Large numbers thickly covered the riffles and bars all the way to the falls, while dead bodies lying in the lower portion of the river testified to a big run having entered some time prior to my visit; and this was confirmed later by Indians, and also by one of the hatcherymen, all of whom remarked upon the large number of sockeye seen on the beds during the latter part of September and the first week in October. No log-jams or other obstructions interfere with the passage of the salmon up-stream. Owing to the clear state of the water the elusive salmon countered every effort to hook it, and only after three hours' hard work was my patience rewarded. The run compares very favourably with those of 1913 and 1914.

The hatchery creek was full of spawning sockeye, the limited beds showing to great advantage; large numbers were observed spawning on the gravel-bars at the entrance. The favourable report of this creek given in 1913 may be compared as an illustration of the conditions here this year, not only in numbers, but in size; exceptionally large fish predominating. No eggs were taken from this point by the hatchery owing to the fence which had been erected having been washed out by the freshet.

The gravel-bar stretching along the upper end of the Owikeno River, near the entrance to the lake, was well stocked with sockeye salmon and should provide its full quota of eggs.

Spring salmon were, as usual, breaking water all the way down the Owikeno River, and an exceptionally fine run should result from the ova deposited by this species of salmon.

In summing up, I am able to report that, with the exception of the head rivers—viz., the Indian, Cheo, and Washwash—upon which I was unable to form any personal opinion as to the run, but from reports received were well stocked with salmon, the spawning-beds of Rivers Inlet received their quota of salmon and compared favourably with the runs here in 1913, 1914, and 1915. Providing climatic conditions did not affect the rivers while the earlier run of salmon were spawning, there is no reason to doubt that the enormous number of sockeye salmon seen on the greater portion of the beds will provide a big run from this season's spawning.

No blame can be attached to the weather for the poor catch obtained by the canneries during the fishing season, as it remained fine for the greater portion of the time. It is probable that the strike of fishermen, which lasted during the first ten days of the run, accounted to a great extent for the failure to put up a larger pack, and also the small size of the salmon, which repeatedly escaped through the nets.

In conclusion, I wish to express my thanks for the courtesy extended by G. C. Johnston, manager of Rivers Inlet Cannery; Captain Hamer, Superintendent of the Dominion Hatchery; and the men at the various spawning camps, to whom I am indebted for a very successful trip.

I have, etc.,

ARTHUR W. STONE,
Fisheries Overseer.

Rivers Inlet, B.C., November 5th, 1917.

THE SPAWNING-BEDS OF SMITH INLET.

Hon. H. C. Brewster,
Commissioner of Fisheries, Victoria, B.C.

Sir,—I have the honour to submit my report upon the result of my inspection of both the watersheds at Smith Inlet and Rivers Inlet respectively for the season 1917.

To obtain an accurate observation on the conditions of the spawning-grounds year by year, both at Smith and Rivers Inlet, at different stages of the spawning season, I considered it advisable to vary the time of the inspection, and this year proceeded to Smith Inlet first.

It is not unusual to experience bad weather conditions at this time of the year, and this trip was no exception to the rule; high winds and sea prevailed, nearly frustrating our efforts to reach Smith Inlet by launch.

Arriving there on September 27th, I engaged Indians and canoe and left for the spawning-grounds at Long Lake.

The Docee River (the overflow to the lake) was pouring down in great volume, and great difficulty was experienced in negotiating the rapids; to reach the lake it was necessary to pack our outfit over the trail. The spring salmon were seen in large numbers both in the river and all along the shores at the mouth of the lake, and was well up to the average of former years.

A terrific downpour of rain, lasting sixty hours, made travelling very uncomfortable, and on arriving at Quay Creek I found that the freshet caused by the torrential downpour had swollen the creek to such an extent that satisfactory observations of the spawning-grounds was precluded, so decided to visit this place on my return from the head of the lake.

The Delabah River was in "freshet" at the time of our arrival, and, as there appeared to be no abatement in the weather, camp was made and the interval employed in drying out.

The weather improving next day made possible an examination of the spawning-beds here. I was glad to see an improvement in the number of salmon over last year; the river was well stocked right up to the falls and compared favourably with the run here in 1915. It will be remembered that the year 1915 was an exceptional one in the number of sockeye salmon spawning on these beds, vast hordes being seen both in the river and distributed along the gravel beach at the mouth. Outside I noticed the sockeye salmon in large numbers spawning along the gravel shores of the lake, and these in number compared favourably with the run of 1915.

Acting upon instructions from the Department to obtain samples of the sockeye spawn, together with scales of the fish, from each of the streams inspected, a collection was made here.

The spawning-grounds of the Geluch River were not seen under such favourable conditions as in the case last year owing to the high stage of the water, the recent heavy rain having caused the lower portion of the river to rise over the banks. Proceeding up the rapids and inspecting each of the small mountain streams emptying into the river, large numbers of sockeye were noted spawning, and this was in evidence all the way to the falls, three miles and a half distant; although better than the run of 1916, the number of sockeye salmon did not reach by any means the high standard of 1914 and 1915, and in making a comparison of the run a decrease of 50 per cent. is noticeable. The river contained no log-jams and enabled the salmon to make full use of the beds right up to the falls. The bears had created great slaughter amongst the salmon, as the dead bodies lying on the rocks and in the bush testified.

Specimens of the sockeye spawn and scales were obtained from this river. The fine gravel-bars at the mouth of the Geluch River and opening out into the lake were well stocked with both sockeye and cohoe salmon.

Returning from the head of the lake, I again paid a visit to Quay Creek, and this time was able to obtain a more favourable opinion of the spawning-grounds here, as the creek had fallen considerably. The sockeye were in evidence, a marked improvement being shown over last year, the run comparing favourably with that of 1915. Cohoe salmon were noticed breaking water all the way down the lake, indicating a fair run of this species of salmon from this season's spawning.

In size the sockeye salmon did not compare with those of the past three years, and reminded me of the small size of the 1913 run at Rivers Inlet. Owing to the fact that my instructions

for that year did not include an inspection of this watershed, I was unable to make a comparison of the 1913 run, either in regard to numbers or size. I am, however, indebted to G. F. Harris, manager of the Wallace Fisheries at Smith Inlet, for the following information, viz.: In 1913 he paid a visit to the spawning-grounds at Long Lake and found the beds full of sockeye salmon, but they were small in size. It is obvious, therefore, that the marked falling-off is not accidental, but a gradual decrease in the runs each year to the spawning-grounds.

The poor showing made by the canneries located at this point would lead one to the opinion there was an exceptionally poor run of sockeye salmon this year, but I think such was not the case. The large number of boats fishing gill-nets on the inlet appear to have split up the schools of salmon and prevented the fishermen obtaining their full toll of fish, and the salmon on reaching the seining-grounds, instead of again schooling up and allowing the seine-nets to make big hauls, passed through to the upper lagoon and on to the lake. In former years it was usual for the gill-net fishermen to obtain rich hauls owing to the few boats fishing, the salmon not being disturbed to such an extent as is the case this year, and on arriving at the seining-grounds schooled up and allowed the seiners likewise to obtain big catches. It will be seen, therefore, although poor consolation both to the gill-net and seine-net fishermen, the large increase in the number of gill-net fishermen fishing on the inlet helped rather than acted as a detriment to the sockeye salmon reaching the spawning-grounds.

It is fortunate restrictions were placed upon the gill-net fishermen fishing in the upper lagoon this season, otherwise I am afraid conditions on the spawning-grounds would have been serious; one has only to compare in proportion the spawning area of Rivers Inlet with that of Smith Inlet to realize how necessary it is to conserve the run to the latter point to obtain the maximum results year by year.

In summing up the results of my inspection of the spawning-grounds, I am of opinion there was a general falling-off in the number of sockeye salmon reaching the beds this year; although better than last year, the run in no way approaches the vast numbers seen on the beds in 1914 and 1915; and I can see no hope of any improvement unless artificial means are employed to counteract the enormous wastage occasioned by climatic conditions affecting the rivers at the time when the salmon are spawning, as was the case this year. The small area of good spawning-grounds available do not warrant the increased demands of the canneries operating at this point.

In conclusion, I desire to extend my thanks to G. F. Harris, of the Wallace Fisheries, for the kind hospitality received at his hands.

I have, etc.,

ARTHUR W. STONE,
Fisheries Overseer.

Rivers Inlet, B.C., November 5th, 1917.

THE SPAWNING-BEDS OF THE NASS RIVER.

Hon. H. C. Brewster,
Commissioner of Fisheries, Victoria, B.C.

SIR,—In obedience to the instructions of the Department, I have made an inspection of the spawning-grounds of various species of salmon in the Meziadin watershed of the Nass River, and beg to submit the following report:—

In company with J. McHugh, Engineer for the Dominion Fisheries Department, who was going in to the fishway at the Meziadin Falls to make some necessary repairs to the crib-work, we left New Westminster on September 10th, and arrived at Prince Rupert on the 12th. On our arrival at Prince Rupert we found that there was a very poor boat service to Stewart, and J. T. Williams, Inspector of Dominion Fisheries, kindly placed the fishery-patrol cruiser "Thos. Crosby" at our disposal to take us to Stewart. We met J. M. Collison at Prince Rupert, who

is Dominion Fishery Overseer on the Nass River and who had arranged to go in with our party, and left Prince Rupert on September 13th. We called in at the Nass on our way up, and obtained two Indian packers and helpers for the trip. We arrived at Stewart on the 14th, and obtained another man, ordered our provisions and outfit, and left Stewart for Meziadin on the 15th. We reached the American Creek Road-house that evening and started out next morning with pack-horses. Owing to small bridges being out we were not able to pack as far with horses as on previous occasions. In crossing the Bear River Glacier the trail in places was completely obliterated owing to the ice having receded, and it was necessary to get down on to the glacier, which made the travelling at times dangerous. From the glacier down the Beaver River we found the trail overgrown and small bridges out. The large bridge over Surprise River was washed out, and we had to ford this river, which was very high, and succeeded in getting a good wetting.

On reaching the head of Meziadin Lake we found that the canoe had been taken away, which necessitated building a raft to carry six persons and outfit down the lake. We also had to make another raft below the first rapids in the Meziadin River. These difficulties which we encountered on the way in made the trip to the fishway longer than we anticipated; however, we arrived at the Meziadin Falls in the afternoon of September 20th.

On our arrival at the falls we inspected the fishway, and Mr. McHugh outlined the work that was necessary to brace up the crib-work, so that there would be no chance of the timbers giving way and depositing the gravel into the fishway. While the bulging in the crib-work was not much worse than when I reported on it in 1916, Mr. McHugh considered it was absolutely necessary to shore it up. We worked on the crib incessantly from the time of our arrival and had the work completed on September 24th.

The nature of the work done was: Upright braces were hewn out and made to fit on the face of the crib-work; they were then braced and held into place with jack-pine timbers, toed into the solid rock on the far side of the fishway, extending right across and above the fishway to the crib-work. Twelve supports were placed across in this manner, and great credit is due to Engineer McHugh for the substantial manner in which the work was done. I have enclosed photographs showing the fishway after the repairs were completed.

On the journey down the lake with the raft we kept close to the easterly shore for a distance. At several places we saw spawning sockeye salmon in the shallow reaches of the lake at its head, and salmon were to be seen leaping in the lake the whole distance down. There appeared to be quite a number of spring salmon in the large pool below the first rapids in the Meziadin River, but they were nearly finished spawning, as several dead springs were noticeable along the shore-line.

On our arrival at the fishway, salmon, both sockeye and cohoe, were passing up freely and continually. Salmon were to be seen below the fall from one side to the other and were leaping on the far side. There were very few salmon to be seen below the lower or smaller fall. The condition of the water this season was very favourable for the ascent of the salmon at the lower falls, there being plenty of water running over the fall for its whole width. I made an inspection on the far side of the Meziadin River across from the fishway and below both falls. There were quite a number of salmon to be seen below the large fall and very few below the lower fall. Cohoe salmon seemed to be more plentiful at the fishway and below the falls than I had noticed on any previous trip of inspection. Very few salmon were to be seen passing up the main Nass River above the junction of the Nass and Meziadin Rivers, although from a point of observation about one mile and a half up the Nass I saw four salmon pass up. The conditions for observing salmon in the Nass River above Meziadin are very difficult, as the water is deep, and not too swift that the salmon have to make their ascent close to the rocks. I inspected the Nass for about two miles and a half above the Meziadin, but saw no further signs of salmon.

We left the fishway on the return journey on September 25th, the weather having turned bad; it rained in torrents, and continued to do so, with the exception of one day, until we arrived back in Stewart. On the return trip up Meziadin Lake some salmon were seen leaping in different places. Owing to the heavy downpour of rain we were chilled through, and were glad to make camp at the head of the lake and get dried out. We left the head of the lake on the morning of the 26th, arriving at Stewart in the evening of September 28th.

In summing up the conditions of the spawning-grounds of the Meziadin watershed of the Nass River, I beg to submit that there was a fair run of salmon, comparing favourably with previous seasons, but not as large as the run of 1916.

The fishway, outside of the repairs reported above, was in good condition, no signs of any check or cracks in the cement-work, and the wing-dam in the river above the fishway still in place. The freshet had washed considerable of the dump away below the large fall, and conditions are nearly the same at this place as they were before the fishway was built.

On reaching Stewart J. T. Williams sent in the patrol cruiser "Thos. Crosby" for our return journey to Prince Rupert. We left Stewart on September 30th, and I arrived at New Westminster on October 2nd.

I have, etc.,
C. P. HICKMAN,
Inspector of Fisheries.

New Westminster, November 23rd, 1917.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON.
(No. 4.)

By Charles H. Gilbert, Ph.D., Professor of Zoology, Stanford University.

I. THE FRASER RIVER RUN OF 1916.

(1.) General Characteristics and the Age-groups.

The run of sockeye salmon to the Fraser River in the summer of 1916 was the poorest known. The catch amounted to 32,146 cases on the Fraser River (including the traps along the southern shore of Vancouver Island) and 84,637 cases on Puget Sound; a total of 116,783 cases. Thus the catch was about 50,000 cases less than in 1915, which was the worst of the previous small years. Not only was the commercial catch the poorest on record, but the spawning-beds reported on by J. P. Babcock yielded in all districts the same story of depletion. Above the canyon the run was everywhere noted as perhaps the poorest ever recorded. While, below the canyon, less eggs were secured by the hatcheries than in any recent season. The total run, then, was undeniably the poorest ever experienced.

Omitting from consideration the three-year grilse, which have little commercial value, the run consisted in part of four-year fish derived from the brood-year 1912, and in part of five-year fish from the brood-year 1911. The last named, 1911, was recorded in this series of reports as the poorest year on the spawning-beds which had been known up to that time. We have seen in a previous report that it delivered a very small number of four-year fish to the run of 1915, and were quite prepared to find an equally small five-year contingent in the run of 1916. But the season of 1912, from which as four-year-olds the greater part of the run of 1916 was to be derived, was reported as unusually favourable, both as to the number taken commercially and also as to those which escaped to the spawning-grounds. The latter were reported by Mr. Babcock as well seeded for an off-year, especially the Chilcotin, the Quesnel, and the Seton-Anderson Lakes sections, all of which are above the canyon. There was no run, however, in the Shuswap-Adams District; and the region below the canyon, Harrison Lake, Morris Creek, and Cultus Lake, had the smallest run that they had ever experienced. Indications from the spawning-grounds were therefore conflicting. The district above the canyon, for an off-year, was well provided with spawners, while below the canyon the numbers showed a marked falling-off. When we recall that the great majority of the off-year sockeyes are furnished by the lakes and streams below the canyon, the fact of an unusually poor run in this region in 1912 must be given full consideration. No great surprise should be occasioned if 1912 should furnish 1916 with a very limited number of four-year fish. This is, in fact, what occurred. Ordinarily, when one brood-year has been a partial failure and fails to deliver its component of a given run in customary abundance, the other component of the run, derived as it is from another brood-year, will be present in usual numbers and will partially save the situation. But in 1916 both the four- and the five-year groups were far below their usual proportions, and the result was the poorest run on record.

In previous reports we have called attention to the fact that where runs fluctuate in size from year to year, the good years most frequently will be characterized by an unusually large proportion of the particular year-group which prevails on that watershed, and the poor years by a deficiency in the prevailing type. Thus in the Fraser River basin, where the great majority of sockeyes mature at four years of age, we find the big years of the cycles characterized by almost 100 per cent. of four-year fish, while the poorer of the small years, like 1911 and 1915, may have the four-year fish but little more numerous than the five-year group. The reasons for this are not far to seek. When two age-groups are present in a run, as in the Fraser River, where we have the four- and the five-year classes, which are derived from two consecutive and wholly independent brood-years, the probabilities are small that the two groups will vary strongly in the same direction at the same time. If one group is phenomenally small in any given year, the other group most probably will be stationary, or a little larger than usual, or even a little smaller. They *may* vary in the same direction and to the same extent, but in the great majority of cases they would not do so. If one group is sparsely represented in any year, ordinarily the other group will be present in about normal proportions, and by comparison will appear greatly

in excess. Furthermore, fluctuations in the subordinate group will have comparatively little effect on the volume of the run. In the Fraser River run the five-year group is the subordinate one. In average years they comprise only 10 or 15 per cent. of the run. Obviously, very small runs could not be caused exclusively by a comparative failure of the five-year group. If the latter should fail completely on the Fraser River the run would not be diminished more than one-fifth.

A complete failure never occurs, and it is clear that extensive fluctuations of the subordinate class in any given year would have little effect on the volume of the run. It is also clear that such fluctuations would have comparatively little effect on the proportions of four-year fish present in the run. If five-year fish in the Fraser were reduced in any year to half their normal number, that would increase the proportion of four-year fish from 85 to 92½ per cent. It is therefore clear that fluctuations of large extent in the volume of the run or in the proportions of the year-groups are occasioned by corresponding fluctuations in the prevailing group. According to this, a large run in the Fraser practically always would be signalized by an extraordinary preponderance of the four-year group, and, conversely, a very small run would be marked by a decided deficiency in this group. Illustrations of this are found in the records from 1911 to 1915. Arranging the catches of these years in the order of their size, and accompanying each with the percentage of four-year fish characteristic of each year, we have the following:—

Table I.

Year.	No. of Cases packed.	Percentage of Four-year Fish.
		Per Cent.
1913	2,402,389	99+
1914	555,557	85
1912	325,451	90
1911	190,586	54
1915	155,714	61

While the correspondence shown above between size of run and the percentage of four-year fish present is not an exact one, the general agreement is clearly brought out. On this showing it might seem possible at the beginning of a run to predict what its proportions would be from the percentage of four-year fish present. But there are two reasons why such a prediction is unreliable. One reason is that the relative numbers of four-year fish are not constant throughout the season. If samples are taken at regular intervals during the fishing season, rapid changes may occur in the percentages of four- and five-year fishes. These are especially marked during the early stages of the Fraser run, in May and June and the early part of July. In the latter part of July, when the main run begins, a definite ratio is established, which persists without change until near the close of the season, and thus characterizes about three-fourths the fish of the year. An unusually complete series of records were obtained during 1916 by Mr. J. P. Babcock, Assistant to the Commissioner. These were made at intervals of about one week, and give us, therefore, a fairly complete account of the changes which occurred during the continuance of the 1916 run. The following table gives the percentages of four- and five-year fish on the different dates for which we have record:—

Table II.

	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
Per cent. four-year fish	88	88	80	24	23	39	89	92	77	76	76	76	90
Per cent. five-year fish	12	12	20	76	77	61	11	8	23	24	24	24	10

In such a case as this, obviously it would be impossible to form any judgment of the constituents of the main run prior to its onset the latter part of July, or to base any predictions founded on the complexion of its initial stages.

There is another reason why predictions of this character would be unsafe in the Fraser River, even if we could know in advance the proportions of the age-groups during the main portion of the run. We have said that under ordinary circumstances it would be highly improbable that in any year two age-groups should oscillate violently in the same direction—that a very poor four-year group would encounter at maturity an equally poor five-year group. If, however, this should occur, the result would be a phenomenally small run, in which, nevertheless, the proportions of the age-groups would remain unchanged and normal. Under ordinary circumstances this would seldom occur. No such case is found in the years cited in Table I., from 1911 to 1915. If the run is being maintained at a given level, and is subject from year to year only to such oscillations above and below the normal as are caused by inequality of natural conditions, the proportions of the age-groups usually constitute a fairly reliable index of the size of the run. But with a river undergoing depletion the conditions are quite different. In the latter case it need occasion no surprise if both four-year and five-year groups in a given year should spring from greatly reduced brood-years and be equally deficient. Such was obviously the case in 1916. Despite the fact that the run was the poorest known, the proportion of four-year fish during the height of the run was 76 per cent., only slightly below the normal. Both age-groups were greatly reduced and almost equally so.

(2.) THE THREE-YEAR GRILSE.

As we have previously pointed out in this series of reports, the year preceding the big year of each cycle is always conspicuous for the large numbers of three-year grilse present in the run. During the other years of the cycle these small males, with paler flesh and poor oil, are few in number and are often difficult to detect. But in the last year of the cycle they may be present in extraordinary abundance—as in 1912, when they constituted numerically about 20 per cent. of the entire run. As these are derived from the eggs of the preceding big year, their relative number during the year of their abundance may give some indication of the size of the succeeding big year. Thus, if less of them occurred in 1916 than in 1912, that might well occasion apprehensions that 1917 would fail to equal 1913.

This problem was of unusual importance in 1916, for the rock-slides in the canyon of the Fraser River in 1913 had blocked the way to the up-river spawning-grounds, and had caused the death without spawning of enormous numbers of sockeyes. The facts were clearly stated by Mr. Babcock in his report for 1913, and adequate warnings given of an impending failure of the big run. But many of the operators refused to concede the seriousness of the situation, and contended that the relatively small number of fish which reached the up-river spawning-grounds in 1913 were adequate to produce a big run. They called attention to the waste which inevitably results when hordes of spawning fish overpopulate the spawning-beds, and the late-comers dig over the gravels already fully seeded, with the consequent exposure and loss of myriads of eggs. Undoubtedly, spawning-beds may be overpopulated in this way and serious loss result. In such cases some reduction in the number of spawners may increase rather than diminish the size of the new brood. The question is always what amount of reduction in a given case can be regarded as beneficial, and when the safety factor shall have been exceeded, with damage to the run. It was the contention of this Department in 1913 that the spawners had been reduced far below the numbers which would be necessary to maintain a run of great magnitude, and that a signal disaster had occurred.

The run of 1916 offered the first opportunity to apply an independent test to these conflicting theories. In 1912, with a pack of over 325,000 cases, tests made at intervals through the summer indicated the presence of grilse constituting on the average 21.5 per cent. of the run. As the run of 1916 amounted to less than 117,000 cases,* it is clear that if the grilse had been as numerous as in 1912 they would have constituted numerically approximately 40 per cent. of the run. The facts were far otherwise. In the first place, the grilse did not run throughout the season, as they did in 1912. None were found among the sockeyes examined during May, June, and the first half of July, captured in the traps on the southern shore of Vancouver Island. On July 17th the first were seen, when two grilse were found in a total of 150 sockeyes examined. On July 27th the grilse from these traps amounted to 11 per cent. of the total.

At Bellingham tests were made on June 16th and 20th and no grilse were found. No further

* In this paper I have adopted for the Puget Sound pack of sockeyes the figures given by the *Pacific Fisherman* in January, 1917.

Bellingham records are available until July 23rd. On that day 2,440 sockeyes were inspected, and among them were found forty-nine grilse, or 2 per cent. Tests were made at Bellingham each day from July 23rd to the 27th, and from August 8th to the 16th. The results are given below:—

Date, 1916.	Number of Sockeyes examined.	Number of Grilse included.	Percentage of Grilse.
July 23	2,440	49	2.0
„ 24	3,280	124	3.8
„ 25	3,964	319	8.0
„ 26	1,856	141	7.6
„ 27	3,661	408	11.0
Aug. 8	3,950	513	13.0
„ 9	2,410	256	10.6
„ 10	2,508	295	11.7
„ 13	1,559	179	11.5
„ 15	791	107	13.5
„ 16	1,102	150	13.6

These dates cover the period of the main run of that year. Probably three-fourths of the sockeyes of the year entered the Fraser during this period in which the grilse approximated 12 per cent. But the early part of the run, amounting to about one-fourth of the whole, was entirely without grilse. Making allowance for this, the number of grilse present during the season is reduced to about 10 per cent. of the entire run. They should have constituted 40 per cent., as we have shown on a previous page, if they had been as numerous as in 1912. Apparently, these three-year fish had suffered a reduction of 75 per cent. because of the blockade in 1913. In so far as they could be accepted as indication of the number of four-year fish to be expected in 1917, these also should be reduced about 75 per cent. below the run of 1913. The pack of 1913 amounted to about 2,400,000 cases. The estimate we were compelled to make for 1917 on the basis of the 1916 grilse was for a pack of 600,000 cases. It amounted to 535,152 cases. It seems, then, that during the times when the big runs still existed the number of grilse present during the preceding year formed a fairly reliable index of the magnitude of the anticipated run.

(3.) CHANGES DURING THE RUN, AND THEIR PROBABLE SIGNIFICANCE.

Our earlier reports on the Fraser River were based on tests which were made mainly or wholly during the latter part of July and the early part of August, when the run was at its maximum. During those days a striking uniformity prevails. For a period of two or three weeks, day after day, there is practically no variation in the relative sizes of the age-groups, the proportions of the sexes, the average size of the individuals, and the size and other characteristics of the nuclear areas of the scales. But when we extend our examination to the earlier stages of the run this is by no means the case. Changes of great magnitude may occur suddenly from one week to another, changes which include more than one factor and in which several characteristics are correlated. Suddenly, the average size of individuals may change in both males and females, the relative sizes of the age-groups may shift extensively, and the characteristics of the nuclear area (which records the growth of the fingerling in fresh water before seeking the sea) may present a sudden transformation. While examining such a series, the impression is strong of a succession of strains or sub-races, at one period of the run appearing pure or relatively so, and later on, perhaps, inextricably mingled with one or more other strains. A striking example of such changes during the progress of the run is given in Table II. The percentage of four-year fish was 88, both on May 26th and June 2nd. Six days later, on June 8th, it had dropped slightly to 80 per cent., as though a new strain were approaching, characterized by a lower percentage of four-year fish. A week later, June 15th, this new form had fully declared itself, and the percentage of four-year fish had dropped to 24. For another week it remained unchanged, registering 23 per cent. on June 22nd. On June 28th it had increased to 39 per cent., marking another transition period, for two weeks later and for another week beyond that the percentage of four-year fish remained about 90. The next ten days marked the beginning of the main run, when the percentage dropped to 76, and remained constant at that point until the run was practically over. We have, then, as regards this character, a period of

two weeks or more marked by uniformity, followed by a short transition period which leads up or down to a new level. When this is reached it remains constant for a further period of longer or shorter duration, and passes by transitions into still another. The uniform periods may mark the presence of pure strains, or they may present composite photographs of two or more strains intimately mixed in definite proportions. Sometimes one condition obtains, sometimes the other. The tabulation of other characters often throws side-lights on this question. To one who watches pass before his eyes this procession of types possessing a certain uniformity, who detects, as is often possible, the advance skirmishers of the next invasion when they make their first appearance during a transition period, who watches the new type becoming the dominant one and the old form soon represented by only a few stragglers—to such an observer the conviction seems inescapable that the run consists of a number of sub-races, each bound to its own spawning area within the Fraser basin. At times they run separately and their characteristics are easily determined and scheduled. At other parts of the run two may be in company, and it may be possible to distinguish them. At other times a larger number of strains may be hopelessly intermingled. If this theory be true, not only do sockeye salmon return to their own river-basin at maturity, they predominantly return to the particular part of the river-basin in which they were reared as fingerlings, in which case their homing instinct is far more rigid in its workings than heretofore has been accepted. How rigid, cannot at present be stated. No limits can be set. Do the salmon, for instance, which have developed from eggs deposited in the gravels of the Horsefly, a tributary of the Quesnel, return at maturity not only to the Quesnel, but also to the Horsefly? Facts are known bearing on this question, which make such a supposition appear by no means improbable:

In Table II., which precedes, we have given the changes in the relative proportions of the four- and five-year classes in a succession of dates throughout the run. It is of interest to consider in connection with these the accompanying changes in the size of the fish. The following tables give the distribution of separate classes of individuals on the basis of length, as these were observed during the season:—

Table III.—Fraser River Sockeyes, Four-year Males, from the Southern Shore of Vancouver Island, 1916, distributed by Lengths and Dates of Capture.

Inches.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
16	1	..	..	..	..	..	..	..	..	..	..	..	..
18	..	..	1	..	..	..	..	..	..	..	..	..	..
18½	..	1	2	..	..	..	..	..	..	..	..	..	..
19	1	5	1	4	..	..	..	..	..	..	..	..	..
19½	1	7	3	..	..	..	..	..	..	..	..	..	..
20	3	13	6	2	1	1	..	..	..	..	..	..	..
20½	1	13	8	1	..	4	..	..	..	..	..	..	..
21	1	18	1	4	2	4	..	..	..	..	..	..	..
21½	3	5	2	..	..	2	..	..	..	..	..	..	..
22	2	6	..	..	1	3	..	2	1	..	..	..	..
22½	..	1	1	1	1	..	..	1	..	..	..	..	..
23	..	..	..	..	4	4	5	5	1	..	2	1	1
23½	..	2	..	1	..	5	10	11	5	1	4	2	2
24	1	2	..	1	3	11	31	14	4	8	5	9	5
24½	..	..	..	1	3	4	22	20	11	13	10	12	4
25	..	..	..	..	1	5	29	22	19	20	15	16	9
25½	1	..	..	..	.	2	13	8	7	11	10	12	9
26	..	..	..	..	..	..	7	7	10	11	12	8	6
26½	..	..	..	..	..	..	3	1	6	6	1	4	2
27	..	..	..	..	..	..	1	1	3	..	2	2	2
27½	..	..	..	..	..	..	..	..	3	1	..	..	..
28	..	..	..	..	..	..	..	..	1	..	..	..	..
Totals	15	73	25	15	16	45	121	92	72	71	61	66	40
Percentage of four-year fish	88	88	80	24	23	39	89	92	77	76	76	76	90

Table IV.—Fraser River Sockeyes, Four-year Females, from the Southern Shore of Vancouver Island, 1916, distributed by Lengths and Dates of Capture.

Inches.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
16	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..	..	..	..	..	..	..
18½	..	1	1	..	..	..	..	..	..	..	..	..	..
19	..	2	4	1	..	..	..	..	..	..	..	..	..
19½	..	6	2	..	1	1	..	..	..	..	..	..	..
20	..	10	2	2	..	1	..	..	..	..	..	..	..
20½	2	11	4	3	..	..	..	..	1	..	..	..	..
21	3	14	1	..	2	..	..	..	..	..	1	..	..
21½	..	4	1	1	..	2	1	..	1	..	..	..	1
22	..	..	1	3	1	3	1	2	3	1	4	1	..
22½	1	3	..	2	4	4	7	2	3	4	3	3	2
23	..	2	1	1	4	9	15	12	11	7	20	12	4
23½	..	1	..	..	2	5	13	17	9	15	17	18	4
24	..	1	..	2	2	9	46	31	16	20	27	32	13
24½	..	..	..	..	..	1	28	19	19	16	12	11	6
25	..	..	..	..	..	2	8	10	11	9	10	11	4
25½	..	..	..	..	..	1	1	5	4	2	2	3	1
26	..	..	..	..	..	..	..	..	1	..	..	1	..
26½	..	..	..	..	..	..	..	1	..	..	1	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals	6	55	17	15	16	38	120	99	79	74	97	92	35
Percentage of four-year fish	88	88	80	24	23	39	89	92	77	76	76	76	90

Table V.—Fraser River Sockeyes, Five-year Males, from the Southern Shore of Vancouver Island, distributed by Lengths and Dates of Capture.

Inches.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
19	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..
22½	..	..	..	..	..	..	..	..	..	..	..	..	..
23	..	1	..	..	..	..	..	..	..	..	..	..	..
23½	..	..	..	..	..	..	..	1	..	..	..	..	..
24	..	..	..	2	..	1	..	..	..	..	..	..	..
24½	..	..	..	1	1	..	..	2	..	..	..	..	..
25	..	..	..	4	5	8	2	..	..	..	..	..	..
25½	..	1	1	1	8	6	2	..	..	1	2	2	..
26	..	1	..	5	17	15	2	1	..	..	3	4	1
26½	..	1	1	4	4	12	1	1	3	2	5	1	2
27	1	1	..	12	13	17	4	..	2	7	5	3	1
27½	..	2	..	6	5	8	3	..	1	4	5	3	..
28	..	..	..	4	4	6	1	1	6	2	5	4	..
28½	..	..	..	..	2	1	1	..	2	2	..	7	..
29	..	..	..	..	..	1	..	..	4	..	2	1	..
29½	..	..	..	..	..	..	..	..	2	..	..	2	..
30	..	..	..	..	..	..	..	..	1	..	..	..	..
Totals	1	7	2	39	59	75	16	6	21	18	27	27	4

Table VI.—Fraser River Sockeyes, Five-year Females, from the Southern Shore of Vancouver Island, distributed by Lengths and Dates of Capture.

Inches.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
19	..	..	..	1	..	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..	..	..	..	..
22½	..	..	..	1	..	..	..	..	..	..	..	..	..
23	1	1	..	1	2	..	..	..	..	..	..	..	..
23½	..	..	..	..	1	1	1	..	..	..	..	..	..
24	..	..	..	3	13	5	1	..	..	..	1	..	..
24½	..	2	..	5	8	2	1	1	1	3	1	4	..
25	1	3	2	17	9	19	3	4	..	4	2	3	..
25½	..	1	3	4	3	14	2	4	1	4	4	8	2
26	..	3	2	14	11	10	3	1	7	4	3	2	1
26½	..	1	..	6	..	4	1	1	5	7	4	2	..
27	..	..	..	2	..	1	..	..	6	5	5	2	..
27½	..	..	1	..	1	..	..	..	2	1	2	2	..
28	..	..	..	..	..	..	..	..	1	..	..	..	..
28½	..	..	..	..	..	..	..	..	..	..	..	..	..
29	..	..	..	..	..	..	..	..	1	..	..	..	..
29½	..	..	..	..	..	..	..	..	..	..	..	..	1
Totals	2	11	8	54	48	56	12	11	23	28	22	23	4

From the above tables it appears that as the season advances a certain increase in length is observed in each of the four classes. This increase is of the greatest extent and is most sharply marked in the four-year fish of both sexes. In connection with the four-year tables, we have given the percentage of four-year fish in the run for each of the dates given. The two classes of data reinforce each other and emphasize the division of the run into the periods so sharply marked by the groups of four-year percentages. These periods are May 26th to June 8th, June 15th to June 28th, July 11th to July 17th, and July 27th to August 10th, the last date of each period (except the last named) partaking more or less of the nature of a transition to the next.

The size of the individuals when captured along the coast of Vancouver Island must closely represent their final size. No further growth in length or weight would seem possible in view of the fact that they have already ceased to feed when taken in the Vancouver Island traps. A few miles to the westward, at the entrance to the Strait of Juan de Fuca, they are freely feeding, for the stomachs of all individuals examined on Swiftsure Banks are gorged with minute crustaceans. But on leaving the open ocean and beginning their definite migration past the shores and through the channels leading to the mouth of the Fraser, they wholly cease to feed. Partially digested and unrecognizable remains are occasionally detected in the stomachs of freshly running fish in the outer part of this range, but nothing further. Not only the incredable amount of energy expended in reaching their spawning-grounds, but also the additional materials for the growth and maturing of the reproductive glands, must be furnished by reserves stored up for this purpose. The use of any portion of these reserves for further growth would seem under the circumstances impossible. On this basis we must face the probability that the earlier-running four-year fish, to whatever part of the river-basin they may be bound, will reach their spawning areas characterized by a smaller average size than are those of equal age which run later. If our theory concerning the parent-tributary theory is correct, if the strains we seem to recognize in the run are bound each to its own spawning district, an examination of these districts should discover fish of different average size and of wide disparity in the relative numbers of four- and of five-year fish. Some should have as high as 90 per cent. of four-year fish, others as low as 23 per cent.

We add below similar tables giving weight-distribution of the separate classes for all the dates investigated. These reinforce the conclusions of the previous tables, and show that total

size increases largely throughout the season. How much of this difference in weight would persist on the spawning-beds it is impossible to foretell. In all cases great reduction in weight occurs as the season advances, for reasons already indicated.

Table VII.—Fraser River Sockeyes, Four-year Males, from the Southern Shore of Vancouver Island, 1916, distributed by Weights and Dates of Capture.

Pounds.	May 26.	June 2.	June 8.	June 15.	June 22.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
2	..	..	1	..	..	..	..	..	..	..	..	..
2½	..	7	3	..	..	..	..	..	..	..	..	..
3	4	24	7	2	..	..	..	..	..	..	..	..
3½	2	23	10	5	1	..	..	1	..	..	..	..
4	5	12	4	2	2	1	..	..	..	..	..	..
4½	2	6	..	1	3	..	2	3	..	1	..	1
5	1	1	..	3	3	13	11	6	2	5	1	4
5½	..	..	..	..	2	24	16	12	8	7	6	7
6	1	..	..	..	1	23	27	22	17	11	17	8
6½	..	..	..	..	2	29	19	11	16	17	20	12
7	..	..	..	..	2	22	10	8	12	13	13	7
7½	..	..	..	..	..	8	6	3	8	6	7	..
8	..	..	..	..	..	...	1	4	6	1	2	1
8½	..	..	..	..	..	1	..	2	1	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..
9½	..	..	..	..	..	..	..	..	1	..	..	..
Totals	15	73	25	15	16	121	92	72	71	61	66	40

Table VIII.—Fraser River Sockeyes, Four-year Females, from the Southern Shore of Vancouver Island, 1916, distributed by Weights and Dates of Capture.

Pounds.	May 26.	June 2.	June 8.	June 15.	June 22.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
2	..	..	..	..	..	..	..	..	..	..	..	..
2½	..	3	4	1	..	..	..	..	..	..	..	..
3	..	23	5	2	1	..	..	1	..	1	..	..
3½	3	18	4	3	..	..	..	1	1	1	..	..
4	2	8	3	3	3	3	3	4	1	2	4	1
4½	1	3	..	3	2	8	4	14	7	14	6	5
5	..	..	..	1	5	26	23	18	18	26	17	10
5½	..	..	..	2	3	37	36	18	20	28	35	8
6	..	..	..	..	2	34	21	16	17	18	23	7
6½	..	..	..	..	..	10	10	4	8	3	4	3
7	..	..	..	..	..	2	2	2	1	3	3	1
7½	..	..	..	..	..	..	..	1	1	1	..	..
Totals	6	55	16	15	16	120	99	79	74	97	92	35

Table IX.—Fraser River Sockeyes, Five-year Males, from the Southern Shore of Vancouver Island, 1916, distributed by Weights and Dates of Capture.

Pounds.	May 26.	June 2.	June 8.	June 15.	June 22.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
4	..	..	..	..	..	..	..	..	..	..	..	..
4½	..	1	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	1	..	..	..	1	..
5½	..	1	..	4	..	..	1	..	..	..	..	..
6	..	1	..	3	2	3	..	..	..	1	..	..
6½	1	1	1	3	6	..	..	3	..	1	2	1
7	..	1	1	8	19	2	1	1	1	4	1	3
7½	..	1	..	8	13	4	..	1	3	4	4	..
8	..	..	..	9	8	3	1	4	3	6	4	..
8½	..	1	..	4	7	1	1	3	4	3	1	..
9	..	..	..	..	4	..	..	3	4	5	4	..
9½	..	..	..	..	..	1	1	3	3	1	3	..
10	..	..	..	..	..	1	..	..	..	2	6	..
10½	..	..	..	..	..	..	..	2	..	..	1	..
11	..	..	..	..	..	1	..	1	..	..	..	..
Totals	1	7	2	39	59	16	6	21	18	27	27	4

Table X.—Fraser River Sockeyes, Five-year Females, from the Southern Shore of Vancouver Island, 1916, distributed by Weights and Dates of Capture.

Pounds.	May 26.	June 2.	June 8.	June 15.	June 22.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
3	..	..	..	..	..	..	..	..	..	..	..	..
3½	..	..	..	1	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..
4½	1	2	..	..	..	..	..	..	..	..	..	..
5	..	3	..	4	3	1	..	..	..	..	2	..
5½	..	2	..	11	11	3	..	..	..	1	..	..
6	..	1	5	16	15	2	1	1	4	1	4	1
6½	1	2	2	11	7	3	3	5	3	8	3	1
7	..	1	..	6	11	..	4	8	10	1	5	..
7½	..	..	..	4	1	2	2	3	7	3	3	1
8	..	..	1	1	..	1	1	2	2	5	4	..
8½	..	..	..	..	..	..	..	3	1	2	1	..
9	..	..	..	..	..	..	..	1	..	1	1	..
9½	..	..	..	..	..	..	..	..	1	..	..	..
10	..	..	..	..	..	..	..	..	..	..	..	..
10½	..	..	..	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..	..	..	..
11½	..	..	..	..	..	..	..	..	..	..	..	1
Totals	2	11	8	54	48	12	11	23	28	22	23	4

The most delicate test of racial difference is found in the scales—in that small central or nuclear area of the scales which is produced during the life of the fingerling in fresh water, and records such peculiarities of growth as accompany life in one particular body of water rather than in any other. Of such bodies of water in the Fraser watershed a wide variety is offered by the numerous lakes which form the final goal of all the ascending sockeyes and furnish the home of their progeny up to the period of their seaward migration. During their period of residence the young salmon react to the physical and biological peculiarities of their special

lake, and in most cases, certainly, form a colony which can be readily distinguished from other colonies in the same basin. They exhibit peculiarities of growth and habit which are recorded on their scales, and these in turn become the centres of the scales of the adults, with all the markings unchanged and the early history still to be read. Life in the sea offers less that is distinctive to any given colony. No barriers exist there with which we are familiar. So far as known to us, each school moves freely about among the feeding-grounds, and is not during the remainder of its life exposed to any special set of conditions. Growth in the sea is very similar on the part of all the colonies, and for this reason the extra-nuclear areas of the scales, recording life in the sea, contain comparatively little that is distinctive. In seeking the finest test of racial difference, we turn first to the nuclear region of the scale. The most obvious character deals with the size of this area and the number of nuclear rings. In general, the number of rings is a measure of the size of the fingerling scale, and this in turn is in general proportionate to the size of the fingerling. If the fingerlings reared in a given lake averaged smaller than those from an adjoining lake the average number of rings on their scales would be less, and if at maturity each colony should return to its own lake to spawn the nuclear rings of the two colonies would show distinctive averages. With the hope of throwing light on the theory of racial differentiation within the river-basin, we have examined the nuclear rings of the scales for numerous individuals on different dates throughout the season. If the tabulations showed close similarity for all the dates we should have to conclude that no differentiation into races had occurred, or that such as did exist were running equally and inextricably commingled throughout. As the tables already presented show striking lack of uniformity in other respects, it will occasion no surprise to find the following tables of nuclear rings reinforcing our contention for local races in the various tributaries, running at times separately, at other times forming a mixture the elements of which cannot be disentangled.

Table XI.—Fraser River Sockeyes, Four-year Males and Females, from the Southern Shore of Vancouver Island, 1916, distributed by Number of Nuclear Rings.

No. of Rings.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
5	..	..	..	1	2	2	1	..	..	..	..	..	..
6	..	1	..	2	3	7	..	1	2	..	2	1	1
7	..	3	1	1	4	8	5	10	7	..	4	8	1
8	2	12	8	6	5	13	16	8	9	..	6	4	3
9	3	27	8	11	1	10	16	18	15	1	1	6	1
10	3	35	5	4	12	6	12	25	15	3	5	7	..
11	5	17	10	..	..	7	10	13	19	3	6	6	3
12	6	17	5	..	1	13	8	13	16	2	9	12	4
13	1	12	1	2	..	2	6	10	8	..	4	3	3
14	..	1	2	..	1	1	15	13	9	1	4	8	3
15	..	2	2	1	1	2	17	11	3	..	4	4	2
16	..	..	..	..	..	..	27	18	6	2	2	5	1
17	..	..	..	..	..	4	31	10	4	..	2	3	1
18	..	..	..	..	..	3	24	12	7	..	1	4	2
19	..	..	..	..	..	1	20	8	3	..	1	..	..
20	..	..	..	..	..	3	22	12	3	..	..	..	4
21	..	..	..	..	..	..	6	2	..	..	..	..	..
22	..	..	..	..	..	1	3	2	1	..	..	..	..
23	..	..	..	..	..	..	1	1	1	..	..	..	..
24	..	..	..	..	..	..	2	..	..	..	..	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..	..

Table XII.—Fraser River Sockeyes, Five-year Males and Females, from the Southern Shore of Vancouver Island, 1916, distributed by Number of Nuclear Rings.

No. of Rings.	May 26.	June 2.	June 8.	June 15.	June 22.	June 28.	July 11.	July 17.	July 27.	July 30.	Aug. 6.	Aug. 10.	Aug. 27.
5	..	1	..	..	1	2	..	..	..	..	..	..	..
6	..	..	..	1	4	4	..	..	..	..	..	..	..
7	..	1	..	8	11	13	..	..	2	..	1	..	..
8	..	..	..	14	22	10	5	2	..	1	5	..	..
9	..	2	4	19	26	30	5	1	6	1	4	2	..
10	..	1	2	20	18	32	4	2	3	..	7	4	1
11	1	1	1	9	14	16	3	5	3	..	7	4	..
12	1	4	..	9	2	11	3	1	5	2	6	3	1
13	..	2	..	1	2	6	3	..	2	1	5	1	..
14	1	1	1	1	1	4	1	..	2	1	5	6	..
15	..	1	..	..	2	..	1	2	3	..	1	..	..
16	..	..	..	..	.	..	..	..	2	1	4	1	1
17	..	1	..	..	..	..	1	..	2	..	1	1	..
18	..	1	..	..	..	..	..	1	1	..	1	..	..
19	..	1	..	..	..	..	2	2	1	..	2	..	..
20	..	1	1	..	..	..	..	2	..	..	..	1	..

Comparing Table XI. with Tables III. and IV., which deal with the same fish classified by length, it is clear that the comparatively small early-running four-year fish, which formed a very large percentage of those which appeared in May and early June, were also marked by small nuclear regions and a very low number of nuclear rings. Compare the numbers of rings shown in the first three columns of Table XI. with those of July 11th and 17th. It is obvious that a different lot of fish have in the meantime come in, characterized by much larger nuclei, with rings ranging well upwards from fourteen, while on the first days the rings were below fourteen in number. On July 11th and 17th a distinct bimodal curve is shown, caused by the presence of two types on these days, one of these having nuclear rings from five to twelve or thirteen, the other from twelve or thirteen on to twenty-four. On the next date, July 27th, the type with larger nuclear areas to the scales had dropped away and was represented by a few stragglers only, and on July 30th it had practically disappeared. The number of individuals shown in this table is not sufficiently high to give perfect curves, and are markedly insufficient during the latter part of the season, during the heaviest part of the run. To make available further data, I subjoin a series of tables based on observations made at Bellingham, Wash., and at Steveston, at the mouth of the Fraser. In general, these show that the characteristics of the run appearing on different dates off the southern shore of Vancouver Island were also observable on similar dates among the channels and at the mouth of the river. The Bellingham records begin June 16th, and contain no trace of the very small race of sockeyes taken May 26th, June 2nd, and June 8th by the Vancouver Island traps. There is also a lack of any record between July 11th and 17th, at the period when the number of nuclear rings in the Vancouver Island fish showed a distinct bimodal arrangement. An unmistakable trace of this arrangement persists, however, in the Bellingham record of July 23rd (Table XVII.) and the Steveston record of July 18th (Table XIX.).

Table XIII.—Fraser River Sockeyes, Four-year Males, Bellingham, Wash., 1916, distributed by Lengths and Dates of Capture.

Inches.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
20½	..	..	..	1	..	..	..
21	..	..	1	..	..	..	..
21½	..	..	..	1	..	..	..
22	..	..	1	1	..	..	..
22½	..	1	1	3	..	..	3
23	..	1	13	6	..	2	4
23½	1	1	11	11	..	2	5
24	2	2	28	18	8	4	9
24½	..	2	21	22	10	14	15
25	..	2	19	20	16	15	8
25½	..	..	11	7	20	11	6
26	..	..	7	4	8	5	6
26½	..	..	2	1	3	2	3
27	..	..	1	..	2	1	1
27½	..	..	..	..	1	..	..
28	..	..	..	..	..	..	1

Table XIV.—Fraser River Sockeyes, Four-year Females, Bellingham, Wash., 1916, distributed by Lengths and Dates of Capture.

Inches.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
20½	..	1	..	..	..	..	..
21	..	..	..	..	..	..	..
21½	..	..	..	4	1	1	1
22	..	2	5	1	4	..	2
22½	1	..	13	2	5	11	8
23	..	6	27	27	5	11	10
23½	1	2	21	30	16	8	16
24	..	4	34	23	27	15	18
24½	..	..	19	12	14	8	9
25	..	..	10	4	6	11	3
25½	..	..	2	2	4	2	..
26	1	..	..	..	..	1	..
26½	..	1	..	..	1	..	..

Table XV.—Fraser River Sockeyes, Five-year Males, Bellingham, Wash., 1916, distributed by Lengths and Dates of Capture.

Inches.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
23½	..	..	1	..	..	1	..
24	1	1	..	..	..	..	..
24½	..	2	..	..	..	..	..
25	1	3	..	2	..	1	..
25½	..	3	4	..	..	2	1
26	6	12	2	4	1	5	1
26½	2	12	5	2	2	..	1
27	9	17	4	2	4	3	7
27½	6	8	2	3	4	2	3
28	2	9	1	2	2	2	2
28½	..	4	1	3	2	1	..
29	1	..	..	2	1	..	..
29½	..	1	1	..	..	..	..

Table XVI.—Fraser River Sockeyes, Five-year Females, Bellingham, Wash., 1916, distributed by Lengths and Dates of Capture.

Inches.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
23½	..	1	..	..	..	1	..
24	3	3	1	1	1	..	..
24½	2	4	3	3	..	3	1
25	7	10	3	5	6	5	2
25½	5	13	6	9	5	2	2
26	12	12	2	3	5	4	2
26½	8	13	2	3	7	3	2
27	2	7	2	4	..	1	1
27½	1	2	1	..	..	..	..
28	2	2	..	..	..	..	..

Table XVII.—Fraser River Sockeyes, Four-year Males and Females, Bellingham, Wash., 1916, distributed by Number of Nuclear Rings.

No. of Rings.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
5	..	1	..	1	..	1	..
6	1	..	1	..	1	..	4
7	2	..	1	4	..	1	4
8	2	..	8	6	4	6	15
9	1	..	8	5	6	3	13
10	..	..	10	9	7	..	8
11	..	1	10	9	6	2	14
12	..	..	5	10	3	..	16
13	..	..	5	5	2	7	9
14	..	..	2	6	2	4	11
15	..	..	3	2	5	2	6
16	..	..	2	2	3	3	8
17	..	..	2	6	1	3	7
18	..	..	10	3	1	1	4
19	..	..	4	4	1	..	2
20	..	..	2	4	..	..	3
21	..	..	..	..	..	..	..
22	..	..	..	3	..	..	1
23	..	..	..	..	..	..	1

Table XVIII.—Fraser River Sockeyes, Five-year Males and Females, Bellingham, Wash., 1916, distributed by Number of Nuclear Rings.

No. of Rings.	June 16.	June 20.	July 23.	July 26.	Aug. 8.	Aug. 13.	Aug. 16.
5	..	..	1	..	..	..	..
6	2	..	..	..	..	..	..
7	1	..	..	..	1	1	1
8	10	5	1	1	..	..	1
9	13	3	1	..	1	..	2
10	18	3	3	..	3	3	..
11	12	5	2	1	2	2	4
12	4	4	1	..	5	..	5
13	..	2	1	2	..	..	3
14	1	..	1	3	..	..	2
15	1	..	4	1	1	1	1
16	1	..	2	..	1	1	..
17	1	..	..	2	1	..	2
18	1	1	1	3	1	1	1
19	1	2	1	1	..	..	..
20	..	1	1	..	..	..	2
21	1	..	..	..	..	..	..

Table XIX.—Fraser River Sockeyes, Four-year Males and Females, Steveston, 1916, distributed by the Number of the Nuclear Rings.

No. of Rings.	July 18.	July 26.	Aug. 12.
6	1	..	..
7	1	..	..
8	2	1	2
9	5	..	3
10	5	4	2
11	5	4	3
12	2	1	4
13	6	2	5
14	7	2	3
15	5	2	4
16	9	3	4
17	8	2	2
18	12	3	2
19	9	1	2
20	7	..	1
21	7	1	..
22	3	1	2
23	4	1	..

(4.) FRASER RIVER SOCKEYES ON THEIR SPAWNING-BEDS.

As has been seen in the previous pages, a close examination of the run in the channels of the sound and the gulf and at the mouth of the river presents clear evidence that it is not a homogeneous assemblage, but consists of a number of distinct groups which may enter these waters singly or more frequently are so intermingled as to obscure their characteristics. If these groups are bound for separate spawning-grounds, as we have assumed, the ultimate test of the theory would be an examination of the populations of distinct spawning areas. Here, according to our theory, we should find relatively pure strains, with the racial characteristics unobscured by admixture with others.

Such an examination of important spawning districts was made by the Department in 1916. Under the direction of Mr. Babcock, C. P. Hickman and W. A. Newcombe obtained scales and measurements from spawning sockeyes in the Chilcotin River above the canyon, and from the Lower Fraser at Morris Creek, the Harrison Hatchery, Pitt Lake, Cultus Lake, Silver Creek, and the Pemberton Hatchery.

The use of scales from the spawning-grounds presents serious difficulties. As the spawning-time approaches, the margins of the scales suffer disintegration, are gradually broken down and absorbed. This occurs with the concealed portions of the scales as well as in the exposed portions, and cannot in any degree be attributed to mere mechanical wear and tear. In fact, as the spawning-time draws near, the scales become more thoroughly protected from mechanical abrasion than ever before. Especially in the males, the integument becomes greatly thickened and the scales are so deeply embedded as almost to disappear from sight. Nevertheless, disintegration of the scales occurs more extensively in the males than in the females. If it is claimed this is due to the more strenuous exertions of the males on the spawning-beds, we must reply that the process begins long before the spawning-grounds are approached, even while the salmon are still in salt water. The Vancouver Island scales give no trouble in this regard. Those from Bellingham present little difficulty until the latter part of the season. But those from Steveston, at the mouth of the Fraser, as has been noted in previous reports, are sometimes of little use for the determination of age, so extensively have the margins been eroded. Fortunately for our purpose, the destructive process does not at the first attack the scale equally at all portions of the margin; the lateral margins suffer first, while still the posterior edge remains for a time intact; and as long as any radius of the posterior field is complete to the margin the age can be determined.

From the foregoing it is clear that the gradual disintegration of the scales as spawning-time approaches is not at all the result of mechanical abrasion, but is one of that extensive series of nutritional and growth changes that accompany the advancing season. These changes are

especially extensive in the males, which produce the greatly elongated jaws provided with large teeth, and the great dorsal hump, in addition to the growth and maturation of the sex products. At the time of entering the river these changes are hardly perceptible, except at the very close of the season. The entire development is carried through while the fish is fasting. Demands are made for materials, and existing structures are drawn upon. Other hard parts suffer besides the scales. The otoliths or ear-bones, which exhibit a laminated structure and have also been used in age-determination, come to appear as though partially dissolved in acid. They become useless for age-determination early in the season, at a time while still the scales can be utilized for this purpose.

The destructive changes which are already well marked at the mouth of the river have gone far on reaching the spawning-grounds. Often less than half the scale remains, with no indication of the amount that has been removed. Age-determination on the spawning-grounds depends on tabulation of lengths of the fish, taken in connection with the occasional individuals with scales sufficiently well preserved. While this method is satisfactory for general purposes, it does not enable us to assign definite proportions of four- and of five-year fish as is most desirable for comparison with certain phases of the run as observed outside the river. We have been compelled in the following tables to include four- and five-year fish in the same group, without distinction.

Table XX.—Fraser River Male Sockeyes examined on their Spawning-beds, 1916, distributed by Lengths and by Locality.

Inches.	Morris Creek.	Harrison Hatchery.	Pitt Lake.	Cultus Lake.	Silver Creek.	Pemberton Hatchery.	Chilcotin.
21	..	..	..	..	..	..	..
21½	..	..	..	..	..	..	1
22	..	..	..	..	..	..	2
22½	..	1	1	2	..	..	11
23	..	..	1	6	..	1	10
23½	..	..	2	5	..	1	13
24	..	..	4	5	..	2	14
24½	..	..	5	4	..	2	12
25	1	..	5	..	..	5	9
25½	1	4	6	2	..	5	4
26	3	6	9	2	..	9	2
26½	6	6	10	..	1	5	..
27	6	11	12	..	1	3	..
27½	3	11	8	..	1	1	..
28	9	6	7	..	..	2	..
28½	3	5	6	..	..	..	..
29	2	4	3	..	..	1	..
29½	1	1	..	..	..	..	..
30	1	2	..	..	..	..	..
30½	..	2	..	..	..	..	..
31	1	..	..	..	..	..	..

Table XXI.—Fraser River Female Sockeyes examined on their Spawning-beds, 1916, distributed by Lengths and by Locality.

Inches.	Morris Creek.	Harrison Hatchery.	Pitt Lake.	Cultus Lake.	Silver Creek.	Pemberton Hatchery.	Chilcotin.
19	..	..	..	..	..	..	..
19½	..	..	..	1	..	1	..
20	..	..	..	1	..	..	..
20½	..	..	..	2	..	1	1
21	..	..	1	4	..	..	..
21½	..	..	2	6	..	..	1
22	1	1	4	30	..	6	17
22½	1	2	4	55	..	11	24
23	2	4	4	84	..	26	44
23½	3	8	5	57	..	30	37
24	4	7	8	40	..	28	22
24½	7	8	6	6	..	6	2
25	11	10	8	3	..	2	3
25½	12	11	7	..	..	1	2
26	7	8	8	..	1	2	..
26½	7	6	5	..	..	..	..
27	9	7	..	..	1	..	..
27½	..	1	..	..	..	..	..
28	1	1	..	..	1	..	..
28½	1	1	..	..	..	..	..
29	..	1	..	..	..	..	..

Table XXII.—Fraser River Sockeyes examined on their Spawning-beds, 1916, distributed by Number of Nuclear Rings and by Locality.

No. of Rings.	Morris Creek.	Harrison Hatchery.	Pitt Lake.	Cultus Lake.	Silver Creek.	Pemberton, 1916.	Pemberton, 1917.	Chilcotin.	Chilcotin, Grilse.
5	..	..	..	..	..	4	7	6	..
6	..	..	..	..	..	10	19	31	..
7	..	..	..	..	..	11	20	40	..
8	..	..	1	4	..	20	27	40	5
9	1	2	3	24	..	12	19	21	8
10	12	10	18	53	..	10	20	17	22
11	8	14	29	74	..	9	12	9	13
12	10	28	24	66	..	2	4	6	8
13	24	21	25	46	..	1	9	2	6
14	21	18	15	26	1	..	2	2	5
15	14	12	10	13	1	..	1	..	..
16	12	5	6	3	2	..	2	..	..
17	11	3	7	1	2	..	..	..	1
18	2	1	..	..	..	..	..	..	..
19	2	..	..	..	..	..	..	..	..
20	3	..	..	..	..	..	..	..	..
21	1	..	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..	..	..

Fortunately for our purpose of investigating racial differentiation, the portion of the scale which remains uninjured invariably contains the nuclear region, and usually contains also the whole of the first year's record in the sea. We are enabled to tabulate the number of nuclear rings from each locality and present them in Table XXII. Taking length-distribution in connection with nuclear range, no doubt can possibly exist concerning the distinctness of the different colonies. Morris Creek and Harrison Hatchery are the only localities which are not readily distinguished. In both of these the fish examined were largely five years old (our approximate

estimate being 80 per cent. of five-year fish) and the nuclear rings were numerous. Pitt Lake also contained a large proportion of five-year fish. The average size, however, is distinctly less than in Morris Creek, in both males and females, and the average number of nuclear rings is also somewhat less. In Cultus Lake the size was very much less than in Morris Creek or Pitt Lake, and they were practically all four-year fish. The number of nuclear rings averaged slightly less than in Pitt Lake, but they were not greatly different in this regard. From Silver Creek we have but six individuals reported, three males and three females. All are five-year fish, with very large nuclear regions, but our material is too scanty for characterization of the race.

The fish of Birkenhead Creek, examined at the Pemberton Hatchery, ally themselves definitely with the up-river colonies. Although they pass through Harrison Lake on their way to the Birkenhead, they are remarkably distinct from any of the late-running sockeyes of Morris Creek and the other districts drawn upon by the Harrison Hatchery. The fish are small in comparison, and were largely four years old, both in 1916 and 1917. Our best estimate, based on the samples presented, is that about 75 per cent. of the Pemberton fish are four years old. But the greatest difference lies in the small size of the nuclear region of the scale and the low number of nuclear rings. This is shown both in 1916 and 1917, the data for which are included separately in Table XXII.

For the up-river spawning districts we have only the Chilcotin River. The run has been reduced to such narrow limits in Fraser and Stuart Lakes, in Seton Lake, and in the Thompson River and Shuswap Lake that it was impracticable to procure material for examination. None was obtained from the Quesnel in 1916.

The Chilcotin fish are of small size; apparently all were four years old that were examined in 1916, and the nuclear areas of the scales are small, with a low number of nuclear rings. These range from five to fourteen in number, with the mode at eight. The yearling migrants from the Chilcotin in 1915 had a slightly larger number of rings, ranging from seven to fifteen (one specimen seventeen) rings. The similarity is close, the difference being no more than was to be expected between one year and another. Favourable and unfavourable seasons doubtless alternate in the lakes and are marked by larger and by smaller fingerlings. For this reason, in comparing the products of different streams, the precaution should be observed that all the material be gathered during the same year. The fingerling output of two lakes may differ strongly in any given year, but in different years each may oscillate above and below the mean of that lake. It might obscure the issue to compare the maximum size fingerling from the poorer lake with the minimum size from the other. It is not even known whether two lakes in the same district oscillate together. This could be ascertained by collecting migrating fingerlings for a series of years from a number of lakes in the same district.

In the Chilcotin, in 1916, a large number of three-year-old male grilse, practically all of which pass through the meshes of the gill-nets in the lower river, were running with the others. The number of nuclear rings on the scales of the grilse are tabulated in the last column of Table XXII. Comparing these with the nuclear rings in the preceding column, it is seen they average distinctly higher than the nuclear rings of the four-year fish. In other words, the male yearlings which attained maturity one year earlier than their fellows averaged larger than the others. Had the male yearling migrants of 1914 been arranged according to size, those which were to develop into grilse would have been found in the upper half of the series. From the industrial standpoint it is undesirable that any salmon should mature at three years of age. The size is small, averaging about 2 lb. in the round, the colour is pale, and the oil very deficient. By one year's further growth at sea their value would increase several hundred per cent. If size of the fingerlings at time of the downward migration should be one of the principal causes which produces early maturing, this fact should be kept in mind in connection with our feeding experiments.

Photographs are presented of scales from spawning sockeyes taken at four different localities. Figs. 1 and 2, from the Birkenhead River, show not only the small nuclear region, provided with slender irregular rings, but the very small first year's growth in the sea, both being characteristic of the Birkenhead fish. In these respects there is a strong resemblance with scales of Rivers Inlet sockeyes, which also have a small fresh-water growth, a very small first year's growth in the sea, and a compensatingly larger growth the second year in the sea. This latter feature also exists in the Birkenhead sockeyes, and results in pushing the third

winter-band well out towards the margin of the scale. The small second-year growth, while more frequently associated with a diminutive nuclear region, is not necessarily so. The habit of so growing, however it may have originated, becomes an inherited trait—a racial mark. This is well illustrated in Fig. 3, from Cultus Lake. The nuclear region here again is small, but the second year's growth is very large, as is usually the case in the Cultus Lake sockeye.

Fig. 4 shows an average Morris Creek scale, with strong, large, regular nuclear region, sharply distinguished from the growth in the sea. The second year's growth is large. Fig. 5, from Pitt Lake, shows a nuclear region of less than average size, but is otherwise characteristic.

The discussions of the 1916 run thus far have concerned themselves only with the class which spend one entire year in the lake after hatching and descend to the sea as fingerlings in the second spring. In addition to this class we have in this watershed two other classes, one of which spends an additional year in fresh water and migrates seaward in its third spring; the other descends as soon as it is free-swimming, and lives practically its entire life in the sea. The latter we have called for this reason the "sea-type." Neither the sea-type nor the two-year-in-the-lake type figure largely in the Fraser run. If both classes were eliminated the annual pack would not greatly suffer. But one feature in connection with their distribution is of interest for our discussion of tributary races. Neither the one class nor the other is evenly distributed in the run throughout the season. No individuals of the sea-type in 1916 appeared on the fishing-grounds during May or June, nor did they appear until the latter part of July, when the main run sets in. On July 17th, out of 210 specimens, two were of sea-type. After this date they occurred on every date of which we have record, and increased steadily until the crest of the run was reached on August 6th, when in 250 specimens examined we found fourteen of this group. The percentages for the different dates follow: July 17th, 0.9 per cent.; July 27th, 4.8 per cent.; July 30th, 4.7 per cent.; August 6th, 5.6 per cent.; August 10th, 2.7 per cent.; August 27th, 1.5 per cent. In 1917 the first specimen of this class was noted at Esquimalt on July 31st. On August 2nd a second was seen. Further individuals appeared as follows: August 6th, 3; August 10th, 6; August 14th, 1; August 20th, 4; August 28th, 1. A similar distribution has been noted in other years, so no doubt can exist that this class on the Fraser belongs exclusively to the late summer migrants.

Examination of spawning fish in the tributaries heretofore given has failed to discover the presence of fish of sea-type. But we present three photographs, Figs. 6, 7, and 8, to illustrate the very peculiar characteristics of the sockeyes which comprise the group spawning at Harrison Rapids. A comparison with the photographs of scales from other spawning districts shows clearly the striking way in which the scales of the Harrison Rapids fish are marked. The centres of the scales are wholly dissimilar from those of other spawning-grounds. The nuclear region does not consist of a sharply defined area marked by the fine lines produced during growth in fresh water, and passing abruptly into the widely spaced lines indicative of sea-growth. On the contrary, the lines gradually widen from the centre outwards and pass by insensible degrees into the growth of the second year. Not only is there no evident lake-growth, there is commonly lacking a definite margin to the first year's growth, a definite winter-band of crowded rings. This is the form we have come to recognize as the sea-type, and as the individuals pass to sea as soon as they are free-swimming and before scales have developed, the scales contain no record of their brief life in fresh water. The photographs presented should be compared with those of sea-type given in our report for 1914, Figs. 1 to 5.

It is a noteworthy fact that this group, which is not numerously represented in any sockeye run, should comprise the great majority, if not indeed all, of the individuals resorting to a single spawning area of the Fraser. We found none of this type in the Chilcotin, the Birkenhead, Cultus Lake, Pitt Lake, or Morris Creek. There were only two doubtful examples from the Harrison Hatchery. It is entirely possible that the sea-type individuals found in the Fraser River run are largely, if not wholly, the product of one spawning district. Practically all of them may result from eggs deposited in the Harrison River below the lake, and may owe their habit of passing to sea as fry to the fact that no lake is there available as a residence. If this be true it will explain the early seaward migration of the fry, while the prevalence of sea-type adults on the Harrison River spawning-grounds will furnish a clear-cut case of the parent-stream theory as applied to the tributaries of a river. After migrating from Harrison Rapids as fry, those which survive not only turn into the Harrison when they come to spawn, but they return to the very gravel-beds in which as eggs their parents deposited them.

In his report for the year 1903, Mr. Babcock writes (page 24): "A considerable number of the late run of salmon spawn in this river [i.e., Harrison River] at the end of the season, but the majority of the late run of sockeye which enter the Harrison pass into Morris Creek and Morris Lake. . . ." The consistently late-running habit of sockeyes of sea-type in the Fraser is then in entire accord with the theory that they are bound largely for Harrison River.

The two-year-in-lake type is more abundantly encountered in the run, but, as in the case of the sea-type, they appear unequally in different portions of it. During the first two dates in June there were two cases in a total of 174, or slightly more than 1 per cent. On succeeding dates in June it rose to 15 per cent., then during July dropped to $^{5}/_{10}$ of 1 per cent., and then increased to the end of the season. The percentages for different dates follow: June 2nd and 8th, 1.2 per cent.; June 15th, 10 per cent.; June 22nd, 11 per cent.; June 28th, 15 per cent.; July 11th, 1.5 per cent.; July 17th, 0.5 per cent.; July 27th, 1.7 per cent.; July 30th, 2.5 per cent.; August 6th, 1.6 per cent.; August 10th, 8.5 per cent.; August 27th, 10 per cent.

Here again, if our theory is correct, we should find the spawning areas differing widely in percentages of two-year-in-lake salmon. The limited material at hand gives the following results: Morris Creek, none; Pitt Lake, none; Cultus Lake, 2.5 per cent.; Harrison Hatchery, 1.5 per cent.; Chilcotin, 6 per cent.; Pemberton Hatchery, 10 per cent. If the Pemberton fish were entering the river not greatly mixed with other strains, we might be able to identify them by their early-running habit, the small number of nuclear rings in the scales, the average size, and the high percentage of two-year-in-lake fish. The only early-running fish which fill these specifications are those which entered the river the latter half of June. Their nuclear rings agreed with the Pemberton fish, they agreed in size, and they had a high percentage (10 to 15 per cent.) of the two-year-in-lake type. The only feature of the two which apparently fails to agree is the small proportion of four-year fish in the June run of these dates and the much larger percentage of four-year-olds in the Birkenhead.

II. THE FRASER RIVER SOCKEYE RUN OF 1917.

(1.) General Characteristics and Age-groups.

The big runs coming to the Fraser River every fourth year have been characterized previous to 1917 by the overwhelming proportion of four-year fish of which they have been composed. In 1913 there were also present an occasional male maturing as grilse in its third year and rarely males and females maturing in their fifth year; but these groups were present in such small proportions that it was difficult to detect any individuals belonging to them. A thousand fish examined at random in 1913 would probably contain none but the four-year group. Prolonged search, day after day, by selecting for examination the largest fish present, often failed to discover any that were five years old. The reason for this has been frequently stated. The five-year fish were present in normal numbers, but were concealed by the vast hordes of four-year-olds, the progeny of the last big run.

If this theory rests on a sound basis, any serious diminution in the size of the run in a big year would cause to emerge the five-year fish. This is what happened in 1917. The run was deprived to a large extent of the progeny of up-river spawners. Four years before, on their ascent of the river, these had been arrested at the canyon and died in the lower river without laying their eggs. Comparatively few of them escaped to the up-river beds early in the season, or later when artificial channels permitted them at favourable times to avoid the rock-obstructions in the canyon. But the numbers thus escaping were wholly inadequate to seed the vast spawning-grounds of the upper river, to which alone we have owed the predominance of the big years. The up-river contingent in the run of 1917 was for this reason comparatively small and the proportions of the big year were lost.

It was not surprising, therefore, to find five-year fish present and easily recognizable in the run. True they were not as numerous proportionately as they are customarily in an off-year. But this can be accounted for in part by the fact that the run, in spite of its great reduction in size, was nevertheless large compared with recent off-years. While the spawners reaching the upper river in 1913 had been totally inadequate to produce a big year, they had materially contributed to a run which was about four times as large as that of 1915 or of 1916.

Another reason why the five-year fish were numerically deficient in 1917 is to be found in the unfavourable brood-year (1912). It is to be recalled that in 1912, exceptional in this respect

for an off-year, a good run developed in certain sections of the upper river, while below the canyon, in the Harrison-Lillooet Lake District and its dependencies, the supply of spawning fish was the poorest which had ever been experienced. It may be urged that the unusual abundance above the canyon should have offset the scarcity below, and a good general average should have been maintained. But we have had no previous experience in computations of this description. We do not know the relative success of up-river and down-river spawners, nor the number of the former that may be required to compensate for a given deficiency in the latter. Certainly, the main results of the 1912 hatching, as exhibited in the run of four-year fish in 1916, were distinctly disappointing.

For this reason alone we should be unwarranted in expecting any considerable supply of five-year fish in 1917. But in still another respect 1912 was to be considered unfavourable as a brood-year for five-year fish. In previous discussions of the relative sizes of the age-groups in the Fraser River run we have been constrained to assume the existence of two factors as relatively constant, whereas we have recognized that either or both of them might fail in this regard. One of these factors is concerned with the percentage of any given school of fingerlings which, for unknown reasons, will mature at five years rather than at four or at three. We have assumed that this percentage, if it could be ascertained year after year, would be found to vary but little. We have no experimental basis for this assumption. It is readily conceivable that the percentages which mature at three, at four, and at five years may vary widely in different broods, under the stress of fluctuating external conditions to us unknown, which may exert a determining influence from year to year, accelerating the age of coming to maturity in some years and retarding it in others. The alternative view, and the one we have adopted heretofore for the purposes of this discussion, contends that the percentages in question are intrinsically determined in the egg, and are relatively independent of external surroundings, which vary from season to season.

The reason for making this assumption is that if it be true we shall be able to explain within reasonable limits the varying proportions of the age-groups in different runs. If it be true, for example, that 10 per cent. of the fingerlings of the Fraser River will mature at five years of age, and that this percentage will hold year after year in successive broods, then we shall have a basis for estimating in any year the numbers of five-year fish to be expected. If the spawning-grounds five years previously had been well seeded, and the success of the spawning and the subsequent life in lake and sea had been demonstrated the previous year when the four-year fish had come to maturity, we should have grounds for anticipating a large five-year contingent in the run of the year. And if, on the other hand, in any given year the percentage of five-year fish should prove far below the normal, we could with confidence seek to correlate this occurrence with a deficiency in the brood-year, five years before. But if our assumption of relative uniformity in the percentage maturing at five years be not justified, we have no basis whatever for predictions and shall meet no success in explaining the distribution of age-groups, varying widely as they do from year to year. In one case we may make faithful efforts to explain the varying phenomena in the runs of successive years; in the other case these phenomena would be the result of variable forces we are unable to calculate. Any measure of success which is obtained in explaining these phenomena would seem to declare in favour of the only assumption on which success could be possible. On this basis we feel justified in expressing our belief that intrinsic factors decide largely, if not wholly, the age at which a fingerling will mature, and that in a given race the percentages maturing at different ages will remain relatively constant from year to year.

The other important factor which is involved in this discussion, and has hitherto been treated as constant, is the distribution of five-year fish among the different tributaries of the river-basin. In the absence of all information on this subject, we have assumed hitherto that in any given year we should find throughout all the tributaries and on all the spawning-beds of the Fraser essentially the same percentages of four- and of five-year salmon. If the average observed at the mouth of the river were 80 per cent. of one and 20 per cent. of the other, we have assumed that approximately 20 per cent. of five-year fish would be found wherever a test could be made, whether in the Chilcotin, the Quesnel, the Thompson, in Cultus Lake, or Harrison Lake, or in the Birkenhead River. There seemed no *a priori* reason to entertain any contrary assumption.

But the case is now different since we have obtained evidence of a large degree of independence in the runs to the different tributaries. Stragglers undoubtedly exist and return to a locality in which they were not spawned. But it is now claimed in the case of these tributaries, as with the independent streams which empty separately in the ocean, that the stragglers are few in number, so few that they exert little or no disturbing influence on the perpetuation of the racial characteristics. It is believed by us that the spawning runs in these streams and tributaries enjoy practical isolation, each from every other, the barriers being wholly formed of fixed habit. Isolation eventually results in divergence, as we have shown in previous pages of this report, based on an examination of the salmon frequenting the different spawning areas of the Fraser River. Among the differences characteristic of these tributary races in 1916 was the prevailing size and age of the spawning fish in different localities. The Chilcotin in 1916 (and the Quesnel in 1917) contained four-year fish only, Cultus Lake contained practically all four-year fish, and the Birkenhead River a very large proportion of four-year fish. Other localities were marked by equally heavy preponderance of five-year fish. Such were Morris Creek, Silver Creek, Harrison Hatchery Creek, and Pitt Lake. If these differences are permanent they will produce a decided effect on the distribution of the age-groups in successive years. The predominatingly five-year streams, as above outlined, are all below the canyon. The streams below the canyon are not noticeably affected by the quadrennial big run; they have no larger bodies of spawning fish in the big years than in the off-years. If they alone, or in greatest measure, are responsible for the five-year fish of the Fraser runs, it becomes clear why no pronounced increase in the percentage of five-year fish occurs in the fifth year of each cycle; i.e., the year after the big run.

According to our previous theory of equal distribution of five-year fish throughout the basin, an increase of these was confidently expected in 1914, when there were due the five-year fish of the same brood that made the 1913 run so notable. A very large proportion of five-year sockeyes was expected in 1914; but they failed to appear in more than the usual numbers for an off-year. In our report for 1914 we called attention to that fact, which then appeared seriously at variance with the expectations our studies had raised. If three years after the big year invariably an enormous increase is observed in the three-year grilse, why—we were compelled to ask—should there not be vast schools of five-year fish on the fifth year of each cycle? We were then unable to suggest any explanation beyond one which we were compelled to admit was *a priori* improbable, that the enormous numbers of fry produced in a big year could in some way influence the individuals in such manner as to hasten their maturity and largely eliminate the five-year element. We are not now compelled to resort to such an hypothesis, for it now seems probable that the five-year fish are produced principally from a section of the river which experiences no increase during a big year. On the other hand, the grilse are produced by streams both above and below the canyon. The spawning runs of the Chilcotin and the Quesnel were richly supplied with them in 1916. In fact, we may anticipate a larger proportion of grilse from those streams which mature their progeny principally at four years than from the predominatingly five-year streams. There is a well-defined tendency among all the salmon for the males on the average to mature somewhat earlier than the females. If in a given stream the body of the females mature at four years, certain males (grilse) will anticipate them one year and mature at three; but if the females of a certain race mature at four and five years, but principally at five, the precocious tendency of the males will find expression in maturing at four in heavier proportion than at five, whereas few will mature at three.

The above discussion of the five-year group in the Fraser River throws additional light on its small proportions in 1917. For the five-year fish of that year were derived from the brood of 1912, and it was during the season of 1912, as we have shown, that the run to that part of the Fraser basin *below the canyon* was the poorest ever known. If the five-year fish come principally from below the canyon the result was inevitable.

The following table gives the percentages of four- and of five-year fish, as these were observed on a succession of dates throughout the season, at Esquimalt (traps along southern shore of Vancouver Island) and at Bellingham, Wash. Close correspondence exists between the records of the two localities and certain definite tendencies are obvious. The season opened with only five-year fish running. From June 1st to June 10th only this class appeared. Our earliest

record at Esquimalt, June 16th, indicates one-third of the run composed of four-year fish, and the remainder of the June records, some Bellingham, some Esquimalt, agree in the increase in four-year percentages, through 46, 57, 61, and 78 on dates from the 18th to the 28th. It will be seen that during June probably more than half the fish running were five years old, a remarkable condition when we recall that in previous big years of the cycle it seemed almost impossible at any period of the run to find any five-year individuals.

Early in July, and continuing throughout the month, the five-year component of the run was reduced to the smallest dimensions. On some days none were observed, and on no day during this period, which included the main run of the year, did the proportion rise above 1 or 2 per cent. Only at the last end, when the run was practically over, the five-year fish again appeared in larger numbers—a condition equally noticed at Esquimalt and at Bellingham. From August 10th to the 28th the percentage varied from 6 to 11, but the total number running at this time was small. This was also true during June, when percentages of five year fish were high. We shall be on fairly safe ground if we adopt 5 per cent. as the proportion of five-year fish for the entire season for comparison with previous years, though 2 per cent. would be a fair average for the main run, which includes the latter part of July and the first third of August. It has usually been during the main run that in previous years the majority of our observations have been made, and from the conditions then existing our proportions of the age-groups have been determined.

Table XXIII.—Percentages of Four- and Five-year Fraser Sockeyes, 1917, observed on a Succession of Dates at Esquimalt and at Bellingham.

ESQUIMALT.			BELLINGHAM.		
Date.	Per Cent., Four-year.	Per Cent., Five-year.	Date.	Per Cent., Four-year.	Per Cent. Five-year.
June 16	34	66	June 1	...	100
June 25	61	39	June 4	...	100
June 28	78	22	June 8	...	100
July 4	96	4	June 10	...	100
July 12	95	5	June 18	43	57
July 14	95	5	June 20	57	43
July 16	98	2	July 6	97	3
July 21	99	1	July 13	98	2
July 23	99	1	July 20	98	2
July 26	100	...	July 22	99	1
July 28	98	2	July 28	99	1
July 31	99	1	Aug. 10	94	6
Aug. 2	100	...	Aug. 23	91	9
Aug. 6	98	2	Sept. 4	71	29
Aug. 10	94	6			
Aug. 14	89	11			
Aug. 18	94	6			
Aug. 20	90	10			
Aug. 28	88	12			
Aug. 31	97	3			

The ranges in sizes for the four-year fish are given in the following two tables for a series of dates from July 6th to August 23rd. Unfortunately, early dates were not available for this purpose either in connection with our data from Esquimalt or from Bellingham. We have no reliable length records of the June schools, when five-year fish were in the majority, or were gradually being replaced by the younger brood. In 1916 these early-running four-year-olds were very small in size and were characterized by small nuclear regions, marked with but few rings. In the 1917 material we have been unable to segregate this run from the rest. There will be noted, however, from the subjoined tables a tendency on the part of both males and females to increase in size as the season advances.

Table XXIV.—Fraser River Sockeyes, Four-year Males, from Bellingham, Wash., 1917, arranged by Lengths and Dates of Capture.

Inches.	July 6.	July 13.	July 20.	July 22.	July 28.	Aug. 10	Aug. 23.
21	..	..	..	..	..	..	..
21½	..	..	..	..	..	..	..
22	5	3	3	..	2	..	..
22½	4	5	1	4	2	..	1
23	14	13	10	3	10	2	1
23½	22	13	29	4	11	4	1
24	15	14	23	11	8	3	6
24½	9	10	24	3	14	3	8
25	2	4	25	7	9	3	12
25½	1	2	11	4	8	..	10
26	..	1	4	..	2	1	3
26½	..	..	..	..	..	..	2
27	..	..	..	..	..	..	..
27½	..	..	..	..	..	..	..

Table XXV.—Fraser River Sockeyes, Four-year Females, from Bellingham, Wash., 1917, arranged by Lengths and Dates of Capture.

Inches.	July 6.	July 13.	July 20.	July 22.	July 28.	Aug. 10	Aug. 23.
21	1	..	..	..	..	..	..
21½	..	2	..	..	..	..	..
22	8	6	1	2	4	2	..
22½	10	19	7	7	3	..	4
23	18	17	28	13	20	..	2
23½	13	25	29	6	23	3	7
24	7	21	27	24	27	3	17
24½	1	7	14	3	10	3	11
25	..	..	4	4	1	2	8
25½	..	..	2	..	..	..	..
26	..	..	..	..	..	..	..
26½	..	..	..	..	..	..	..

The number of nuclear rings in both male and female four-year fish is given for twenty-one different dates in Table XXVI. If this be compared with Table XXII. of the present report, in which are given the number of nuclear rings separately for a number of spawning districts, the composite character of the run as it enters from the sea is at once evident. Its range in numbers for separate days is obviously greater than in the sub-races which inhabit the tributaries. The seven tributaries listed in Table XXII. from fairly adequate numbers of specimens show the following range in number of rings from their lowest to their highest: 13, 10, 10, 10, 9, 12, 10. A similar selection of dates from Table XXVI., including only those representing a fairly adequate number of individuals, exhibit the following ranges: 14, 15, 17, 15, 16, 15, 16, 15, 14, 14, 18, 23. From this showing it seems evident that in the run for 1917 the fish bound for two or more tributaries were entering the river together.

Striking differences are observed on comparing Table XXVI. with Table XI., the present report, which gives similar data for the season of 1916. July 11th, 1916, shows the nuclear rings distributed in a clearly marked bimodal curve, representing a form with fewer rings, ranging from five to twelve (corresponding with the Pemberton or Birkenhead River range of the same year), the form having the more numerous rings ranging from thirteen to twenty-four. The corresponding date in 1917, July 12th, entirely lacked the first of these classes, and shows the nuclear rings ranging from thirteen to twenty-five, thus agreeing exactly with the second group present at the same time in 1916. The spawning district for this second group is not indicated clearly in Table XXII. None of the districts there represented has a range of nuclear rings from thirteen to twenty-four. Silver Creek may prove to belong there, the six specimens of which we have record ranging from fourteen to eighteen, but the number of specimens available is far too limited to determine that matter.

Table XXVI.—Fraser River Sockeyes, Four-year Males and Females, from the Southern Shore of Vancouver Island, 1917, distributed by Number of Nuclear Rings.

No. of Rings.	June 16.	June 25.	June 28.	July 4.	July 12.	July 14.	July 16.	July 21.	July 22.	July 23.	July 26.	July 28.	July 31.	Aug. 2.	Aug. 6.	Aug. 10.	Aug. 14.	Aug. 18.	Aug. 20.	Aug. 28.	Aug. 31.
6	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	1	2	..	1	1	..	..	1	..	..	..	..	1
8	..	..	5	..	..	..	2	..	..	4	..	1	4	1	1	1	1	..	2	5	..
9	2	6	2	..	..	..	1	..	2	8	1	6	4	2	..	3	2	1	8	3	1
10	12	7	6	1	..	1	3	2	18	4	1	13	11	6	2	2	..	3	11	5	5
11	1	4	4	..	..	1	6	..	23	23	1	14	16	5	1	3	..	7	12	5	1
12	4	3	2	..	..	1	11	5	20	18	3	15	19	13	3	4	4	5	14	4	7
13	1	..	9	1	1	1	6	10	19	10	2	15	19	17	8	5	8	3	11	3	3
14	..	..	2	4	2	3	15	7	14	15	9	18	11	10	6	7	9	2	7	..	3
15	3	..	8	4	2	6	3	8	11	8	12	10	12	19	17	5	1	3	3	1	3
16	1	3	1	1	4	6	7	3	2	9	4	8	13	9	18	11	8	6	3	..	2
17	..	3	4	3	5	2	3	3	6	3	4	8	2	6	13	7	3	1	4	..	1
18	..	..	7	3	3	5	2	4	..	1	4	1	5	3	13	7	1	2	3	..	2
19	..	1	6	3	..	..	5	1	2	1	6	1	4	1	7	5	2	..	3	1	1
20	..	..	..	2	..	3	1	2	2	1	2	1	..	1	4	4	3	3	1	..	1
21	..	..	1	..	2	1	..	1	1	1	1	1	..	4	2	..	3	5	..	..	1
22	..	..	..	..	..	1	..	..	1	..	1	..	..	..	..	2	2	2	1	..	..
23	..	..	..	..	1	1	2	1	..	..	..	..	..	..	1	..	..	1	1	1	..
24	..	..	..	2	..	1	1	1	..	..	1	..	..	..	..	..	..	..	1	..	..
25	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..
29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..

In the run of 1917, as in that of the previous year, different types could be recognized, whether the observer were located at the traps on Vancouver Island, at Bellingham, or at the mouth of the Fraser. The early-running fish were demonstrably different from those running a little later, and at the close of the season in the latter part of August, there is a mixture of several very distinct forms bound up-river in company. An exhaustive examination of the population of the different spawning-grounds, with tabulations of all the characters by which these races are distinguishable, would doubtless furnish a key to the recognition of the various races as they appear singly at the mouth of the river, or more frequently two or more mingled together.

Five photographs of sockeye-scales are given, to illustrate some of the forms which are encountered in the run. Striking as some of these are when viewed singly, they become much more so when the characteristics are found repeated in hundreds of individuals running at the same time, while those running at another period agree in having quite different distinguishing marks. It is impossible at the present to state with certainty the destination of any of the races detected at the mouth of the river or in the sound, but obvious resemblances are manifest between the types we here illustrate and certain of the spawning-groups whose scale-photographs we have already given.

Fig. 9 represents a scale with moderate or small nuclear region (from the centre to the line marked 1) and with a very small second year (lines 1 to 2). The latter is a striking feature and is subject to comparatively little variation within the limits of a group or race. The difference becomes obvious on comparing Fig. 9 with Figs. 10, 11, and 12, in all of which the second year's growth is large, as is predominatingly the case in Fraser River sockeyes. Fig. 9 may with advantage be compared with the race running to the Birkenhead River, represented in Figs. 1 and 2. That race is also marked by a small second year's growth, but the nuclear region is usually smaller than in Fig. 9, and is marked by more slender, irregular rings, which are never firmly drawn and parallel.

Fig. 10 represents the scale of a late-running fish with rather small nuclear region and distinctly large second year's growth. It stands perhaps nearest the Cultus Lake form, repre-

sented in Fig. 3, but the differences are obvious and it would be rash to make the identification. In Fig. 3, the latest year's growth in the sea—the marginal band of coarse rings outside Fig. 3—is comparatively small and seems to indicate that this form ceases to feed in the midsummer or earlier. The late-running fish have made more growth during their longer summer on the feeding-grounds, and frequently, as in Fig. 10, have largely completed the growth of the year and have experienced the beginnings of the winter-check before starting on their spawning migration. This winter-check is evident in Fig. 10 at the extreme outer margin of the scale, where several fine rings are crowded closely together to form the beginnings of the winter-band. It is almost as well marked at this time as the third winter-band seen at Fig. 3. It becomes increasingly evident that the so-called winter-band usually is formed in the fall. After it is once formed no increase in the length of the fish appears to take place during the winter months, and in the older individuals usually none until late spring or early summer. The five-year fish running in June have their scales still margined with the winter-band of rings, the new growth of the year not having begun.

Fig. 11, characterized by a large nuclear region, with firmly marked numerous parallel rings, is one of the prevailing types. The second year's growth is also large. If any single form were selected to represent the Fraser River run, it should be the one here figured. It prevails during the last half of July and the early part of August, and furnishes the greater part of the main run which occurs at the time mentioned. Considerable variation is shown in the size of the nuclear region and the number of nuclear rings. It is possible that more than one spawning district of the lower river produces fish with closely similar markings on the scales. Only a thorough inspection of the spawning districts can settle this question, but Fig. 11 may be compared with Fig. 4, representing the Morris Creek race. In this also the nuclear region is large, the nuclear rings strong and parallel, with an abrupt transition between them and the sea-growth beyond. The similarity is thus striking.

Fig. 12 represents the early June run of five-year fish, with small nuclear region and with large, vigorous, sharply marked annual growths in the sea. The winter-bands on the scales are narrow and stand out clearly. A strong resemblance can be noticed between this and the Pitt Lake form, represented in Fig. 5. But further investigation would be needed to declare their identity. The range in the number of nuclear rings in the Pitt Lake race is given in Table XXII. as eight to seventeen. The form with small nucleus, which was the only race present in the run during the greater part of June, 1916 (*see* Table XI.), had a similar range of nuclear rings, five to fifteen.

Fig. 13 is a form represented by scattering individuals in July and August. The nuclear region is of enormous size, but seems to have so distinctly the marks of fresh-water growth, and passes by such insensible gradations into the usual large-nucleated form shown in Fig. 11 that we have been inclined to consider it the extreme of that series. None have thus far been observed on any spawning-grounds.

III. THE RIVERS INLET SOCKEYE RUN OF 1916.

(1.) The Age-groups.

In his report for 1916, Mr. Babcock calls attention to the fact that the catch at Rivers Inlet was very poor throughout the season, and that this was accompanied by a reduction on the spawning-grounds to not above 25 per cent. of a normal spawning. The pack was only 44,936 cases, much the poorest for the last decade. The reason for the falling-off is not obvious. The five-year fish, which constituted the greater part of the catch, were spawned in 1911, when the pack of the season amounted to 88,763 cases. The four-year fish were derived from 1912, when one of the largest packs was made (112,884 cases) ever known on Rivers Inlet. The average proportions of the two-year groups throughout the season of 1916 were about normal. As shown in Table XXVII., the five-year group was most heavily represented at the beginning of the season, 93 per cent. of the fish belonging to that group on June 27th. On subsequent dates the relative numbers of five-year fish steadily diminished, until near the close of the season, August 4th, the two groups were present in almost equal numbers, the percentage of five-year fish having diminished to 53. The regularity with which this process continued is most interesting and surprising. The falling-off in five-year fish was evident even when observations were separated by an interval of only two or three days. The only interruption in the process occurred during the week following July 21st. On July 25th the percentage of five-year fish had risen from 69

to 78, a point it must have reached on its downward course about July 12th. But two days thereafter, on July 27th, the percentage had again fallen to 68, about where it had been a week earlier. The regularity of this process throughout the season, coupled with the fact, to be stated later in detail, that the phenomenon was exactly repeated during the season of 1917, gives the impression that we are here dealing with a fundamental tendency, that the older fish, other things being equal, will first seek the spawning-grounds. It is therefore the more surprising that during the season of 1915 the exact reverse of this procedure was observed. The records of that year also covered the greater part of the fishing season, beginning with July 5th and continuing until August 2nd. The changes in the relative abundance of the two groups were of much less extent than in 1916, the five-year class varying only from 79 to 92. But the tendency toward a regular progression is perfectly marked and is in the contrary direction. The season opened with the smaller relative numbers of five-year fish, while successive dates registered an increase. The percentages run 79, 84, 84, 88, 92.

It is evident from the above that the run of 1915, which was exceptionally heavy, contained an average higher percentage of five-year fish than did the year 1916. The average during 1915 was 87 per cent.; during 1916, 76 per cent. Our experience with the Rivers Inlet runs since 1912 has led us to expect the heaviest percentages of five-year fish during the seasons of greatest abundance. This is shown in Table XXII. on page 41 of our report for 1915. But although this expectation is frequently justified and holds to some degree in the present instance as between 1915 and 1916, it fails on a wider comparison of 1916 with previous years. Seventy-six per cent. of five-year fish is only slightly below what obtained in 1912 (79 per cent.), which was one of the most successful ever experienced on Rivers Inlet, and is well above the five-year percentage in 1914, when the pack was double that in 1916 and the spawning-grounds were fully populated. Evidently in 1916 the normal proportions of the two age-groups persisted in the face of the poorest run ever known, because both groups were equally diminished. Whether this signifies an equilibrium for the river at a lower level than has heretofore existed can only be determined by future experience.

Table XXVII.—Percentages of Five-year Rivers Inlet Sockeyes occurring at Different Dates in the 1916 Run.

Dates.	Percentage of Five-year Fish.	Number of Specimens examined.
June 27	93	125
June 29	92	100
July 4	90	50
July 11	84	50
July 13	76	50
July 18	72	54
July 21	69	100
July 25	78	50
July 27	68	50
Aug. 2	60	50
Aug. 4	53	50

Average five-year fish for the season, 76 per cent.

(2.) DISTRIBUTION OF THE SEXES.

During every season in which we have made observations at Rivers Inlet, the four-year males have exceeded in number the four-year females and the five-year females have shown a like preponderance over the five-year males. With the sole exception of 1912, the proportions have been very similar in successive years. The average of four-year males for 1916 is 74 per cent. and the females 26 per cent., an exact duplicate of the percentages reported for male and female four-year fish in 1913. This close correspondence is the more surprising when we consider the wide changes which occur in these percentages during the progress of the fishing season, and the fact that the earlier records were based on few observations. The percentages may vary as widely during the season as do those of the age-groups, already discussed, but during the height of the season the average is attained. It is doubtless this average during the height of the

season which the earlier records obtained. It is interesting to note in Tables XXVII. and XXVIII. that the average both of age-group distribution and in the relative numbers of four-year males and females occurred on the same day, July 13th.

Table XXVIII. presents the varying numbers of males and females of both age-groups on a series of dates throughout the season. Here also we find an orderly succession of events. In both four- and five-year groups there is a well-marked tendency for the males to precede the females. As this tendency was observed also in 1915 (*see* Table XXX., page 45, report for 1915) and was equally evident in 1917, as will later appear, it may be accepted as well established for Rivers Inlet. For Smith Inlet we have but two observations during the season, but in 1915 a decided increase in the percentage of females was noted on the later of the two dates. On the Skeena River, in 1915, results were inconclusive with respect of the four-year fish, but the five-year females showed a steady increase during the course of the run. Their percentage of the five-year group on July 3rd was 47; on July 10th, 50; on July 21st and 22nd, 64 and 62. The tendency for males to run early in disproportionate numbers, therefore, is not confined to the Rivers Inlet race, but appears to be generally distributed.

Table XXVIII.—Percentages of Males and Females in Rivers Inlet Sockeyes occurring on Different Dates, Season of 1916.

Dates.	June 27.	June 29.	July 4.	July 11.	July 13.	July 18.	July 21.	July 25.	July 27.	Aug. 2.	Aug. 4.
Four-year males	100	100	100	88	75	71	45	64	69	45	61
Four-year females	..	..	..	12	25	29	55	36	31	55	39
Five-year males	67	61	47	38	31	36	36	41	35	23	23
Five-year females	33	39	53	62	69	64	64	59	65	77	77

Average percentages—

Four-year males	74
Four-year females	26
Five-year males	40
Five-year females	60
Average total males throughout season	52
Average total females throughout season	48

(3.) LENGTHS AND WEIGHTS.

The remarkable uniformity in the size attained by the Rivers Inlet race year after year may again be commented on. The 1912 records are less reliable than those made later, being based on a small amount of material, and are not included in Table XXIX., which gives below the average lengths for the last four years of each age-group and for the males and females separately. During this period of four years the extreme difference in the averages of any one group does not exceed $^3/_{10}$ inch. When observers note that the fish are running large in any given year it can only mean an unusual percentage of five-year fish, and when they are running small, with a larger number than usual to the case, it can only mean the four-year group is present in larger numbers than is normal for this stream.

Table XXIX.—Average Length in Inches of Rivers Inlet Sockeyes for Four Successive Years.

	1913.	1914.	1915.	1916.
Four-year males	22.9	23.0	22.9	22.9
Four-year females	23.0	22.8	22.8	22.8
Five-year males	25.9	25.9	26.0	25.8
Five-year females	25.2	25.2	25.1	25.0

(4.) UNIFORMITY OF TYPE.

In comparison with the Fraser River sockeyes, the Rivers Inlet race exhibits a striking uniformity of type throughout the run. The very small nuclear region, marked with only a few rather weak and often irregular rings, the very small second year's growth, the compensatingly wide third-year area on the scales—all of these characteristics are well marked. No succession of recognizable forms appear here as in the Fraser. The impression gained is of a completely homogeneous assemblage. The reason for this difference between the two streams is obviously to be found in the simplicity of the Rivers Inlet basin compared with the Fraser. In the former there is a single short stream heading in a single lake, which is but little above the level of the tides. The salmon spawn partly in the gravels of the beaches, but most abundantly in the lower courses of the numerous short tributary streams. Here, evidently, the close similarity of external conditions, together with the close proximity of the spawning-grounds which unquestionably favours a larger percentage of strays passing from one bed to another—all these characteristics of the Owikeno basin tend to keep the race constant, to prevent its being sharply divided into sub-races in accordance with the special tributaries which they frequent. But although the fish proceeding to the different tributaries of the Owikeno are so similar that we are unable to separate them, or any of them, as they appear in the run, we have hitherto thought ourselves to be not without indication that they do nevertheless segregate themselves in the lake, and each group passes to its parent tributary to spawn. The only alternative view to this would be that the fish form a common school in the lake and pass indifferently to one or the other tributary. Were this the case, the average in one stream would agree in all respects with the averages from other streams. If no selection were made on any basis for the different tributaries there would be no basis for any differences to appear. Each would be drawing its population from the common reservoir.

It is clear, therefore, if we can observe any differences between the populations, however small these differences may be, if only they appear constantly year after year, we shall be compelled to concede that they represent selected communities, and not chance portions of a general mass. In our report for 1914 (page 57) we comment on a certain difference in the sizes of the eggs produced by the fish frequenting the various tributaries of Owikeno Lake, and call attention to the significance of this fact if it can be determined beyond question. It could only mean that incipient races were established also in the Owikeno basin as the result of such degree of physiological isolation as might exist between the various streams. The evidence before us has been obtained during the seasons of 1914, 1915, 1916, and 1917 by Fishery Overseer Arthur W. Stone, whose co-operation in securing data for scientific purposes has been unremitting and most fruitful of results. The collections of the first two seasons seemed favourable to the theory of a constant difference in the average sizes of eggs in the various tributaries. The material was of necessity very imperfect for this purpose. The eggs were in vials, preserved in formalin, a single vial for each locality, and the eggs of each vial from a single female. Individual variation among salmon in the size of the eggs they produce is well known to occur. There was obvious danger in the present instance that individual variation in the size of eggs would be mistaken for stream character. This danger could be avoided only by comparing similar series for a succession of years. The results for 1914 and 1915 were favourable. Arranging the vials in the order of size of eggs, beginning with the smallest, the six stations represented in 1914 followed one another in this order: Cheo, Washwash, Indian River, Asklum, Jeneesee, Quap. Concerning the extremes of the series there could be no question, but in certain instances one might be entitled to doubt which of two adjacent stations should be placed first. Ten streams were represented in the collection of 1915. The vials were again arranged in order of apparent size of eggs without consulting the stream labels. When finally in an ascending series, the list read as follows: Hatchery Creek, *Cheo*, Nookins, Sheemahant, *Washwash*, *Indian River*, Sunday Creek, *Quap*, *Jeneesee*, *Asklum*. The italicized names are also in the 1914 list. The first three were also the first three in 1914 and follow each other in identical order; the last three had that general position also in 1914, but the individual order is reversed. On the whole, the correspondences seemed as close as could be expected, much closer than chance would likely furnish. But the 1916 list almost exactly reversed 1915 throughout. Placing the vials

again in order of size, beginning with the smallest eggs, we have the following astonishing series: Asklum, Quap, Jeneesee, Washwash, Indian River, Nookins, Hatchery Creek. In 1917 the series read: Jeneesee, Sunday Creek, Nookins, Hatchery Creek, Sheemahant, Quap, Asklum. It becomes evident, then, that no results can be reached along this line of inquiry. Individual variations in any one of the tributaries seem to be as great as the alleged differences between the streams. The fact that Quap and Asklum presented the largest eggs of the series in three of the four years might lead to a more thorough examination in their case, eliminating the possibility of individual variation by taking mixed masses of eggs derived from many females. For the present we have no evidence of the existence of distinguishing characteristics of the salmon populations seeking the different streams tributary to Owikeno Lake. But that fact does not prove that the Owikeno salmon fail to return to their own streams at spawning-time. It means simply that in this instance we have as yet no proof that they do so. Minute racial differences may actually exist, so minute that we have failed to detect them. Or it may be that no differences have yet developed, although the breeding colonies are wholly separate and have been so for long periods of time. Then, again, even though the spawners return in the main to their native stream at maturity, there may be always, in tributaries of a single lake, a sufficient proportion of strays from other tributaries to interbreed and keep the stock true.

(5.) To what Extent do Individuals stray to other Streams?

We have frequently mentioned the probability that some percentage of any race will stray away and enter strange rivers, but this statement is not based on any direct evidence concerning the Pacific salmon. In fact, our experience with strongly marked races of sockeyes, in which foreign interlopers would be sure of detection, has convinced us that such a mixture of races is of infrequent occurrence. In the Fraser River, where the sockeyes running together exhibit such diversity of type, some strays might enter without being recognized as aliens. But the Rivers Inlet race is so homogeneous and so strongly marked that invaders from other Provinces, with the possible exception of Smith Inlet, would certainly be detected. Yet during the examination of many thousands of specimens of the Rivers Inlet race, extending now over a period of six years, we have never had occasion to question the race of any individual until in 1916. At the beginning of this season, on June 27th, June 29th, and July 4th, a few individuals appeared with important characters wholly unlike those of the Rivers Inlet race. None of them appeared on any other dates than those mentioned. There were twenty-four specimens in all, and these exhibit the same combination of characters with astonishingly little variation. Three of them are four-year males, thirteen are five-year males, and eight five-year females. The photographs of scales of two of these possible interlopers are given below (Figs. 14 and 15) for comparison with the Rivers Inlet stock (*see* report for 1913, Figs. 1, 2, 3, and 4). The differences consist principally in the large size of the nuclear region in these aberrant specimens, and even more strikingly in the uniformly large size of the second year's growth. In Rivers Inlet fish the small nuclear area averages five to seven rings, the vast majority falling between four and nine, with very few either above or below these figures. But the individuals in question range exclusively between thirteen and eighteen, numbers which lie outside any observed range of variation in Rivers Inlet stock. And inasmuch as this character is constantly coupled with the very extensive growth during the first year in the sea—Rivers Inlet fish being noted for the small amount of this growth—it seemed a not unwarranted conclusion that we were here dealing with stragglers from some other district. Smith Inlet is excluded from the list of possibilities, as are Bella Coola and Kimsquit, for all three have still different characters. They cannot have come from any of the smaller sockeye-creeks known to me, such as Namu Creek, or the numerous small streams opening into the passages between the islands. There is a strong resemblance with certain of the Fraser River forms. Compare, for instance, Figs. 14 and 15 with Fig. 10 of this report, which happens, however, to be a four-year fish. It might seem not impossible that these individuals entering Rivers Inlet the last of June had strayed from a school of Fraser River sockeyes which were approaching the northern end of Vancouver Island. This school would later enter the channels lying east of the Island and would traverse these channels on their way to the mouth of the Fraser, which they approach from the north. That such a school exists and passes annually through Johnstone Strait and Seymour Narrows has now been

demonstrated (report for 1915, pages 31, 33, and 37). The large proportion of five-year fish among these few "strays," three out of twenty-four, or 87 per cent., is no bar to this theory of their origin. For while the average percentage of the five-year fish in the Fraser River run of 1916 was much less than this, it will be seen from Table II., this report, that during the latter part of June the five-year fish were far more abundant than at other periods of the run. On June 15th they represented 76 per cent.; on June 22nd, 77 per cent.; and on June 28th, 61 per cent. of the total. A certain degree of probability, therefore, might be made to attach to the theory that these are Fraser River sockeyes. One fact, however, stands strongly opposed to this theory. The small group of individuals are in size well below those running in the Fraser at any time during the season. The thirteen five-year Rivers Inlet males of peculiar type ranged from 22½ to 26 inches, the eight five-year females from 22 to 25 inches, and the three four-year males from 21 to 22½ inches. The detailed distribution is given in the following table:—

	21.	21½.	22.	22½.	23.	23½.	24.	24½.	25.	25½.	26.
Four-year males	1	...	1	1	...	...	...	...	...	...	...
Five-year males	....	...	...	1	1	4	1	1	2	2	1
Five-year females ..	...	...	1	1	...	1	3	1	1	...	...

Turning for comparison to Tables III., V., and VI. of this report, we find that five-year Fraser River males on June 28th were ranging from 24 to 29 inches, with the mode at 26½; and five-year females on the same date ranged from 23½ to 27 inches, with the mode at 25. At no time during the season were the Fraser River lengths at all comparable with those shown by the above group, and in view of this fact it becomes impossible to accept such theory of their origin. The problem must be left unsettled for the present. It is not impossible that these may be a highly exceptional group of the Rivers Inlet stock, beginning with extraordinarily vigorous growth as fingerlings, wholly opposed in this respect to the traditional habit of the race. It may be that the racial habit of forming a small growth during the first year in the sea stands related with small growth as fingerlings. If that is the case, any individuals which were exceptional in one respect might become exceptional also in the other. Some support is found for this theory in the fact that a few Rivers Inlet individuals which occurred also in the early part of the run belonged to the two-years-in-lake type; and these also, after two full years in fresh water, with the larger growth that accompanied this habit, formed on reaching the sea a large vigorous growth during their first year in salt water. We are finally of the opinion that our aberrant specimens are exceptional individuals of the Rivers Inlet race, with unknown cause for their special history. If this be true, we have yet to encounter any strays from one stream to another.

(6.) Yearling Migrants in Rivers Inlet.

Investigation of the yearling migrants in 1914 and 1915, as shown in previous reports of this series, apparently discovered an unexpected phenomenon in the order in which these young fish were passing out of the lake and down the river to the sea. Heretofore it had been believed the average size of the migrants remained constant throughout the season, this being based on observations by Chamberlain on the Naha River in Alaska. On that basis it would seem probable that only the largest sizes passed out at the beginning of the season, the others increasing in stature as they remained behind to feed in the lake. As these in turn reached the average size of the first migrants they successively started on their downward movement.

But our experience on Rivers Inlet in 1914 and 1915 seemed to indicate that the average size of yearling migrants does not remain constant, but experiences a material reduction as the season advances. On this basis we should conclude as in the former case that the larger sizes pass out first, but those remaining behind, while growing rapidly at this season as evidenced by the widely spaced rings of the new season's growth at the margins of their scales, are never quite able to overtake in size the earlier migrants. It seemed desirable to verify this history during a third season, examining the yearlings from day to day throughout the migrating period. With this in view, Fisheries Overseer A. W. Stone spent the month of May and the first half of June on the

Owikeno River, and by means of a fyke-net obtained daily samples of the little salmon passing down-stream. A total of 1,650 of these were preserved and have been measured separately and tabulated by days and by sex. The results are given in the following tables, which completely verify the findings of the two previous years. The tendency to reduction in size is well marked throughout in each sex, and becomes strongly pronounced near the close of the season. The smaller sizes remaining in the lake then push forward, and in Owikeno Lake pretty thoroughly exhaust the yearling supply by the time the migrating season closes. Only a few remain over in this lake until their third spring, and these, as we can determine by the rings on their scales, were on the average the smallest of the yearlings at the time they failed to accompany their fellows of the preceding year. This two-year-in-lake class is very poorly represented in Lake Owikeno. Some lake should be chosen for investigation in which this class represents an important component of the run. On such a lake a close examination of the migrating habits of yearlings and two-year-olds would be most instructive.

Table XXX.—Male Yearling Sockeyes, Rivers Inlet, 1916. Lengths in Millimetres on Successive Days of Migration.

Mm.	May.											
	18.	19.	20.	21.	22.	23.	24.	25.	27.	28.	29.	30, 31.
40	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..
46	..	..	..	..	..	..	..	..	..	..	..	..
47	..	..	..	..	..	..	..	..	..	..	..	..
48	..	..	..	..	..	..	..	..	..	..	..	..
49	..	..	..	..	..	..	..	..	..	..	..	..
50	..	..	..	..	1	..	..	..	1	..	..	..
51	..	..	..	..	..	..	..	..	..	..	..	..
52	1	..	1	..	..	..	..	..	..	..	..	..
53	..	..	..	..	..	..	..	..	..	..	..	..
54	..	..	..	..	..	..	..	..	1	1	..	..
55	..	1	..	..	1	..	..	2	..	..	..	..
56	1	..	1	..	1	1	..	1	..	1	..	4
57	..	1	1	..	2	2	1	2	1	2	..	3
58	..	..	..	..	..	..	1	1	..	1	1	5
59	..	..	..	..	1	2	2	2	1	1	1	9
60	..	2	3	2	4	3	4	..	3	6	1	6
61	..	1	..	4	5	4	5	4	7	6	4	3
62	..	..	1	3	2	1	4	8	1	6	1	5
63	..	1	1	2	2	4	2	5	5	7	..	1
64	..	3	6	..	6	5	7	12	4	11	..	3
65	..	..	1	2	2	1	2	3	6	12	1	4
66	..	..	2	1	5	1	3	4	5	8	..	..
67	..	..	2	2	2	5	5	8	4	3	..	..
68	..	..	2	1	3	..	2	..	2	2	..	2
69	..	..	5	2	1	2	2	1	5	3	..	2
70	..	..	1	1	1	..	..	..	3	1	1	1
71	..	..	2	..	..	..	..	2	2	..	..	1
72	..	..	1	..	..	1	..	1	..	4	1	..
73	1	..	..	1	1	3	..	..	..	..	..	1
74	..	..	..	2	..	1	..	2	1	..	..	1
75	..	..	..	..	..	..	..	..	2	2	..	..
76	..	..	..	..	1	..	1	..	1	..	..	..
77	..	..	1	..	..	..	..	..	2	..	..	..
78	..	..	..	..	..	..	..	..	1	..	..	..
79	..	..	1	..	..	..	..	..	..	..	..	..
80	..	..	..	..	..	..	..	..	..	..	..	..

Table XXX.—Male Yearling Sockeyes, Rivers Inlet, 1916. Lengths in Millimetres on Successive Days of Migration—Concluded.

Mm.	June.															
	1.	2.	3.	4.	5.	6.	7.	8.	10.	11.	12.	13.	14.	15.	16.	17.
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
46	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	1
47	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
48	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	2
49	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
50	..	1	..	..	..	..	..	..	..	..	2	1	3	..	..	1
51	..	..	..	..	1	..	..	1	2	1	..	4	6	..	..	..
52	1	..	1	..	..	..	..	..	5	2	3	9	9	3	1	..
53	..	1	..	3	1	..	..	2	2	6	5	7	7	1	..	1
54	..	2	..	2	1	1	2	..	15	5	6	4	13	4	2	1
55	3	1	1	5	3	4	6	6	15	11	5	19	12	3	1	..
56	4	1	3	3	4	2	11	4	22	6	5	8	9	4	..	..
57	4	1	4	6	6	6	20	10	14	4	11	12	11	2	..	..
58	4	..	2	3	2	5	11	9	11	5	5	3	3	1	2	..
59	7	2	5	9	4	6	11	9	10	3	1	2	1	..	..	..
60	5	2	8	9	5	3	20	6	8	3	2	3	1	1	..	..
61	6	2	1	1	3	6	15	1	3	2	1	1	2	..	..	..
62	1	..	4	4	3	5	17	6	2	1	1	3	..	..	..	..
63	1	..	2	4	2	3	1	3	2	..	..	..	..	..	..	..
64	1	1	3	3	3	2	6	2	..	1	1	..	..	..	..	..
65	1	2	1	2	1	3	1	..	..	..	1	..	..	..	..	..
66	..	..	1	..	..	1	1	1	..	..	..	..	..	..	..	..
67	1	..	..	1	..	1	3	..	..	..	..	1	..	..	..	..
68	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	..
69	2	..	..	..	..	4	1	1	..	..	..	..	..	..	..	..
70	..	..	..	..	..	1	..	..	1	..	..	1	1	..	..	..
71	..	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..
72	1	1	1	..	..	2	..	..	..	..	..	..	..	..	..	..
73	..	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..
74	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..
75	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..
76	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
77	..	..	..	..	..	4	..	..	..	..	..	1	..	..	..	..
78	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..
79	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
80	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..

Table XXXI.—Female Yearling Sockeyes, Rivers Inlet, 1916. Lengths in Millimetres on Successive Days of Migration.

Mm.	May.											
	18.	19.	20.	21.	22.	23.	24.	25.	27.	28.	29.	30, 31.
40	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..
46	..	..	..	..	..	..	..	..	..	..	..	..
47	..	..	..	..	..	..	1	..	..	..	..	..
48	..	..	..	..	..	..	..	..	..	..	..	..
49	..	..	..	..	..	..	..	..	..	..	..	..
50	..	..	..	..	..	..	..	..	..	..	..	..
51	..	..	..	..	..	..	..	..	..	..	..	..
52	..	..	..	..	..	..	..	1	..	..	..	..
53	..	..	..	..	..	..	..	1	..	..	1	..
54	..	..	..	..	..	..	..	..	..	..	..	..
55	..	..	..	..	..	..	..	1	..	..	..	1
56	..	..	..	..	1	1	1	2	2	2	..	..
57	..	..	..	..	..	..	2	1	..	..	..	4
58	..	..	1	..	..	..	..	1	1	..	..	4
59	..	..	1	1	2	1	5	2	1	1	1	5
60	..	..	2	..	2	1	6	3	3	1	..	5
61	1	..	2	1	3	1	4	1	1	5	..	2
62	..	2	4	2	6	4	6	5	6	4	..	4
63	..	..	4	3	4	3	6	5	3	4	3	5
64	..	3	2	2	6	2	7	5	2	5	..	2
65	..	..	2	2	6	1	5	5	5	11	2	..
66	1	..	1	3	2	2	2	1	1	8	..	1
67	..	..	1	1	3	3	2	1	5	4	1	3
68	..	..	5	..	2	1	..	1	4	5	1	..
69	..	..	1	..	3	1	3	..	..	..	..	..
70	..	1	..	2	1	..	2	3	..	1	1	2
71	..	..	1	..	1	..	..	2	1	1	1	..
72	..	..	..	1	..	..	2	..	..	1	1	..
73	..	1	2	..	..	..	2	1	1	..	..	1
74	..	..	..	..	..	..	1	..	..	..	..	..
75	..	..	1	..	..	..	1	..	1	1	..	..
76	..	..	..	..	..	..	..	..	..	1	..	..
77	..	..	2	..	..	..	..	..	..	..	..	..
78	1	..	1	..	..	..	1	..	..	..	..	..
79	..	..	..	1	..	..	..	..	..	..	..	..
80	..	..	..	..	..	..	..	..	..	..	..	..

Table XXXI.—Female Yearling Sockeyes, Rivers Inlet, 1916. Lengths in Millimetres on Successive Days of Migration—Concluded.

Mm.	June.															
	1.	2.	3.	4.	5.	6.	7.	8.	10.	11.	12.	13.	14.	15.	16.	17.
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
47	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
48	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..
49	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
50	..	..	..	1	..	..	..	..	..	..	..	..	3	..	..	..
51	..	1	..	..	..	..	..	..	..	1	..	2	1	..	1	1
52	..	..	..	3	..	..	..	..	3	1	..	7	9	..	..	1
53	..	..	..	..	1	..	1	..	6	3	3	4	5	1	..	..
54	3	2	1	1	..	..	3	5	10	4	5	6	10	2	..	..
55	3	..	2	1	1	2	5	5	13	8	9	24	17	1	3	1
56	2	5	2	8	2	2	9	5	6	9	5	10	4	3	1	..
57	5	6	1	3	4	2	17	10	14	7	11	11	8	1	..	..
58	2	1	2	7	7	2	14	8	12	..	4	2	4	2	1	..
59	5	3	8	6	6	4	12	5	7	1	2	3	6	2	..	..
60	4	..	7	11	5	7	19	9	8	1	..	1	2	..	1	..
61	4	2	3	7	4	4	19	8	2	..	..	2	..	..	..	..
62	5	2	2	3	..	2	13	6	1	..	..	..	1	..	..	..
63	2	..	2	3	1	5	4	2	2	1	..	..	..	..	..	..
64	1	..	1	4	..	4	5	2	1	1	..	1	..	..	..	..
65	..	..	1	1	1	3	1	2	1	..	1	..	..	..	..	..
66	..	..	..	..	1	..	2	..	..	..	..	..	..	..	..	..
67	..	..	2	1	1	..	..	..	..	..	1	..	..	..	..	..
68	1	..	..	..	..	3	1	1	..	..	..	..	..	..	..	..
69	2	..	1	..	..	1	1	1	..	..	..	..	..	..	..	..
70	1	..	..	2	..	1	..	..	..	..	..	..	..	..	..	..
71	1	..	..	..	..	2	..	1	..	..	..	..	..	..	..	..
72	..	..	..	..	..	3	1	1	..	..	..	..	..	..	..	..
73	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
74	..	..	1	..	..	1	..	1	..	..	..	..	..	..	..	..
75	..	1	1	..	..	2	..	1	..	..	..	..	..	..	..	..
76	..	1	..	..	..	2	1	..	..	..	..	..	..	..	..	..
77	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..
78	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..
79	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
80	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..

A satisfactory indication of the extent to which average size of migrants in the Owikeno River decreases during the season is obtained by comparing the average size of the males during the first three days of migration, the 18th, 19th, and 20th of May, with their average size on the last three days, the 15th, 16th, and 17th of June. On May 18th to 20th they averaged 64.7 mm.; on June 15th to 17th they averaged 54.4 mm. There was an average loss of 10.3 mm., or 16 per cent. of the original size. A fair average size for the season can be estimated midway between the opening and closing of the run and gives us 59.6. The average for both sexes was 58.6 in 1914 and 59.7 in 1915. Very few parasites attacked the yearlings in 1916.

It remains to consider the relative numbers of males and females. As we have daily records throughout the season, these data become of unusual value. During May the number of females equalled or slightly exceeded the number of males on only five out of thirteen days, the proportion for the month standing 60 per cent. males and 40 per cent. females. During June the females equalled or exceeded the males on only five out of sixteen days, the proportion for the month standing 52 per cent. males and 48 per cent. females. Proceeding on the assumption that the total run in May equalled that in June, we have for the season 56 per cent. males and 44 per cent. females. The figures for 1915 were 55 per cent. males and 45 per cent. females.

IV. THE RIVERS INLET SOCKEYE RUN OF 1917.

(1.) GENERAL CHARACTERISTICS AND AGE-GROUPS.

The run for 1917 was thoroughly disappointing, being only a little better than the previous year, which was the poorest for many seasons. The pack for 1917 was 61,195 cases, slightly less than the records for 1908 and 1913, in each of which years less than 65,000 cases were put up. The fish which formed the run of 1917 were derived in part (67 per cent. of the run) from 1912 and in part (33 per cent.) from 1913. In 1912 the pack amounted to over 112,000 cases, and would seem to indicate a large run. The visit to the spawning-grounds in 1912 was undertaken at too early a date, so we have no indications for that year of the numbers of fish that escaped the fishermen. We give below a table showing the constitution of each run since 1912, with the brood-years from which they were derived.

Table XXXII.—Percentages of Four- and Five-year Rivers Inlet Sockeyes in Runs from 1912 to 1917, with the Broods from which they were derived.

Run of the Year.	Percentage, Four and Five Years old.	Brood-year from which derived.
1912 (112,884 cases)	5 yrs. 79%	1907 (87,874 cases).
	4 yrs. 21%	1908 (64,652 cases).
1913 (61,745 cases)	5 yrs. 20%	
	4 yrs. 80%	1909 (89,027 cases).
1914 (89,890 cases)	5 yrs. 65%	
	4 yrs. 35%	1910 (126,921 cases).
1915 (130,350 cases)	5 yrs. 87%	
	4 yrs. 13%	1911 (88,763 cases).
1916 (44,936 cases)	5 yrs. 76%	
	4 yrs. 24%	1912 (112,884 cases).
1917 (61,195 cases)	5 yrs. 67%	
	4 yrs. 33%	1913 (61,745 cases).

The difficulty of accounting adequately for poor runs in Rivers Inlet by our experience of the two previous seasons from which the run was derived is well exemplified by the above table, especially by the last two years. With its unusually large catch, 1912 contributed to both of these years, yet we find them both comparative failures. But neither in 1911 nor in 1912 did we have any detailed reports from the spawning-beds, and these after all give our best available basis for estimating future runs. It must be admitted that the breeding-grounds of Owikeno Lake are in an unsatisfactory and more or less precarious condition. Fishery Overseer Stone has for several years called attention to the log-jams which obstruct passage in some of the largest and finest of the grounds for natural propagation. With unfavourable weather conditions these jams might in any year effectually bar passage to salmon. We do not know to what extent the hatchery fish contribute to the annual supply and to what extent the run is dependent on natural spawning. Certainly, no chances should be taken with the stream on the assumption that the hatchery operations are adequate to maintain the run unaided. The tributaries should be promptly cleared of their obstructions, and where passages can be blasted over falls and large areas of good spawning-grounds be made available, that should be done. The care of the spawning-beds is one of the most important and the most deplorably neglected branch of salmon-culture. It cannot be stated that the alarming decline in two successive sockeye runs to Rivers Inlet is due to this cause. But the matter deserves immediate attention.

It was ascertained in 1916 that the run to Rivers Inlet is not of uniform composition throughout. The relative numbers of the components of the run change materially as the

season progresses. An entirely similar series marked the run of 1917. On the opening of the season the fish were averaging large in size and proved to be almost exclusively in their fifth year. Only 6 per cent. were in their fourth year. But in the course of the season there was a constant change in this respect, the five-year fish becoming less and less numerous relatively to the younger class. Observations were usually made at intervals of three to five days. Each succeeding date shows a lessening in numbers of five-year fish until July 24th and 28th, when an irregularity occurs. But at the close of the fishing season, from the last of July into August, instead of a preponderance of five-year fish, we have the reverse condition; the percentage has dropped from 94 to 44. The average for the season is 67 per cent., the five-year fish being less abundant than in 1916. The very reverse of this would have been expected if high reproductive efficiency had been credited to the big year 1912. As this year furnished the four-year fish for 1916 and the five-year fish for 1917, we would have been justified in predicting that both of these year-classes would be unusually large, producing an extensive four-year group in 1916 and a still larger five-year group in 1917. Both of these results would have co-operated in emphasizing the preponderance of five-year fish in 1917. As nothing of this sort occurred in either year, we are fairly justified in assuming that the size of the catch in 1912 gives no reliable indication of the success on the spawning-grounds of that year.

Table XXXIII., giving percentages of five-year fish throughout the season, affords an interesting comparison with Table XXVII., which gives the same data for 1916. The run began in both years with the same percentage of the five-year group (93 and 94 per cent.), and in both cases this percentage declined steadily throughout. But in 1917 the descent was more rapid and abrupt than in the previous year, a lower level is attained at the close (44 instead of 53 per cent.), and a lower average maintained.

Table XXXIII.—Percentages of Five-year Rivers Inlet Sockeyes occurring at Different Dates in the 1917 Run.

Dates.	Percentages of Five-year Fish.	Number of Specimens examined.
July 4	94	50
July 10	88	50
July 13	82	50
July 16	70	50
July 21	59	50
July 24	73	50
July 28	41	50
July 31	46	50
Aug. 3	44	50

Average five-year fish for the season of 1917, 67 per cent.

(2.) THE SEXES.

Another progressive change which occurred in the constitution of the run was in the relative numbers of males and females in each year-group found in a succession of dates. Here, again, the procedure exactly parallels the occurrences of the previous year. The males in both groups were in larger relative numbers at the beginning than they were later on in the run. The four-year males constituted at first 100 per cent. of the group, but gradually diminished, until at the close of the season they fell as low as 52 per cent. The five-year males on July 10th formed 59 per cent. of the five-year group, but by August 3rd they had diminished to 19 per cent. The averages for the season are given at the bottom of Table XXXIV., which follows. It will be noted that the total males for the season averaged 53 per cent. of the run, while during two seasons for which we have record the migrating yearlings had 55 and 56 per cent. males.

Table XXXIV.—Percentages of Males and Females in Rivers Inlet Sockeyes occurring on Different Dates, Season of 1917.

	July 5.	July 10.	July 13.	July 16.	July 21.	July 24.	July 28.	July 31.	Aug. 3.
Four-year males	100	100	89	73	71	74	58	52	56
Four-year females	..	..	11	27	29	26	42	48	44
Five-year males	47	59	54	51	51	36	42	23	19
Five-year females	53	41	46	49	49	64	58	77	81

Average percentages—

Four-year males 75

Four-year females 25

Five-year males 42

Five-year females 58

Average total males throughout season ..... 53 per cent.

Average total females throughout season ..... 47 per cent.

The results are so close to expectation that we can now consider it demonstrated that the preponderance of males over females in four-year fish and the reverse condition in five-year fish in Rivers Inlet are both due to the tendency of males somewhat to anticipate the females in age of maturing. Where the average age of maturing is four and the females principally mature at that age, the precocious tendency of the males will find expression in the liberal production of three-year grilse, which are almost uniformly males. But where, as in Rivers Inlet, the prevailing age for maturing is five, the precocious tendency of the males does not seem to extend far enough to bring any considerable number to maturity at three, but causes a much larger proportion of them to mature at four than in the case of the female.

(3.) LENGTHS AND WEIGHTS.

We have had such uniform experience with the size attained by Rivers Inlet sockeyes year after year that we have come to consider it in that respect one of the most perfectly standardized races. Males and females of each of the age-groups have given averages for each year since 1912 with a total range of variation of not more than $^{2}/_{10}$ or $^{3}/_{10}$ inch, differences which seem well within the limits of error inherent in our method. It is the more astonishing to find all the averages for size in 1917 far below what has hitherto been observed. In five years previous to 1917 the averages of five-year males have ranged only from 25.8 to 26 inches; but in 1917 they drop down to 25 inches. Five-year females for those same years were standardized at 25.1 or 25.2 inches (24.6 in 1912 was evidently unreliable, as based on too limited material); but in 1917 the length declined to 24.4 inches. Similarly, four-year males which had in previous years ranged from 22.9 to 23.2 averaged only 22.5, and four-year females which previously were found between 22.8 and 23 inches were only 22.3. The measurements in 1917 were made by the same skilled observer, Fishery Overseer A. W. Stone, who has made the previous records on which we rely. There can be no possible reason for doubting the accuracy of the records of 1917. Furthermore, the decrease in the lengths stands in perfect agreement with the records for weight. In 1914 and 1915 five-year males averaged 7.3 lb. and five-year females 6.8 and 6.6 lb. In 1917 the males averaged 6.6 and the females 6.2. Four-year males dropped from 5.4 or 5.3 lb. down to 5, and four-year females from 5.2 or 5.1 down to 4.9. If this general decrease in 1917 is occasioned by unfavourable conditions in the sea, we do well to note that the 1916 fish showed no trace of being exposed to them. All classes of the 1916 Rivers Inlet run were fully up to the average size. The unfavourable conditions must have manifested themselves after the 1916 run had left the feeding-grounds. Similar effects are found in the 1917 runs to the Skeena and the Nass. A discussion of the subject appears in later pages which contain the report on the Nass River run for 1917.

Table XXXV.—Average Length in Inches of Rivers Inlet Sockeyes for Six Successive Years.

	1912.	1913.	1914.	1915.	1916.	1917.
Four-year males	23.2	22.9	23.0	22.9	22.9	22.5
Four-year females	22.8	23.0	22.8	22.8	22.8	22.3
Five-year males	25.8	25.9	25.9	26.0	25.8	25.0
Five-year females	24.6	25.2	25.2	25.1	25.0	24.4

Table XXXVI.—Average Weight in Pounds of Rivers Inlet Sockeyes for Four Successive Years.

	1914.	1915.	1916.	1917.
Four-year males	5.4	5.3	5.5	5.0
Four-year females	5.2	5.1	5.0	4.9
Five-year males	7.3	7.3	7.6	6.6
Five-year females	6.8	6.6	6.7	6.2

V. SKEENA RIVER SOCKEYE RUNS OF 1916 AND 1917.

(1.) General Characteristics and the Age-groups.

The Skeena River sockeye-pack for 1916 was the poorest for the preceding decade, with the single exception of 1913. These two years, 1916 and 1913, had to their credit respectively 60,927 and 52,927 cases. The smallest previous year of the decade had a catch of 87,901 cases; the largest year, 187,246 cases; and the average for the ten years, excluding 1913 and 1916, was 124,222 cases. Comparisons of this kind on the Skeena are not complicated, as they are on the Fraser River, with the necessity for making allowances for increases in both kinds and amounts of fishing-gear. For several years fishing conditions on the Skeena have been as nearly standardized as it is possible to make them. With fishing restricted to gill-nets of prescribed length and size of mesh, and the number of these nets rigidly determined, we are given the best possible opportunity to estimate the numbers of salmon that can safely be spared from the Skeena run. If a tendency is shown for the packs to decrease, with the other conditions remaining unchanged, no doubt can exist that we are overfishing the river. In that case further restriction is called for and should be applied at once.

We have previously called attention to the difficulty in the case of the Skeena River of explaining the success or failure of a given year on the basis of the amounts packed four and five years previously. We meet the same difficulty with regard to the year 1916. While the four-year fish descended from the apparently indifferent brood of 1912, with a pack of 92,498 cases, the five-year fish, which always constitute the most important element in the Skeena run, sprang from the brood-year 1911, when a pack of over 130,000 cases seemed to indicate an extensive run, which was apparently confirmed in part by the reports from the spawning-grounds. Yet the 1911 contribution to the run of 1916 was only 36,554 cases. For comparison with this showing we may cite the brood-year 1909. The total catch of Skeena River sockeyes for that year was only 87,901 cases, yet five years thereafter the five-year fish of the 1909 brood alone contributed 97,623 cases to the pack of 1914. It is evident that the amount of the pack on the Skeena River furnishes year by year unsatisfactory indications of the size of the runs. 1909 furnished not only 97,623 cases of five-year fish to the run of 1914; it had previously given 26,463 cases of four-year-olds to the run of 1913. The total commercial yield from the 1909 brood was over 124,000 cases, indicating that the year was one of high degree of success on the spawning-grounds. We have not now available any description of the weather conditions in 1909. If these were distinctly unfavourable for gill-netting in the exposed reaches off the mouth of the river, there may have been a larger percentage of escape than usual up the river.

The following table gives the percentages of four- and five-year sockeyes in each Skeena River run since 1912, with the brood-year for each class and the number of cases packed each year:—

Table XXXVII.—Percentages of Four- and Five-year Skeena River Sockeyes that spent One Year in Lake, in Runs of Successive Years.

Run of the Year.	Percentage, Four and Five Years old.	Brood-year from which derived.
1912 (92,498 cases)	5 yrs. 43%	1907 (108,413 cases).
	4 yrs. 57%	1908 (139,846 cases).
1913 (52,927 cases)	5 yrs. 50%	
	4 yrs. 50%	1909 (87,901 cases).
1914 (130,166 cases)	5 yrs. 75%	
	4 yrs. 25%	1910 (187,246 cases).
1915 (116,553 cases)	5 yrs. 64%	
	4 yrs. 36%	1911 (131,066 cases).
1916 (60,923 cases)	5 yrs. 60%	
	4 yrs. 40%	1912 (92,498 cases).
1917 (65,760 cases)	5 yrs. 62%	
	4 yrs. 38%	1913 (52,927 cases).

In connection with this table it is of interest to add together the packs of the two brood-years which contributed to each run, and then arrange the runs in the order of their size, beginning with the smallest. In presenting this table below, we have stated the amount of each pack in even thousands of cases. It is evident that if we can show any correlation between the size of catch of a given year and the catches of the two combined brood-years, that should show in the statement below. Arranging the years in the order of their pack should also bring the corresponding brood-years in the order of their catch, beginning with the smallest.

Table XXXVIII.—Skeena River Sockeye Packs compared with Combined Packs of the Two Brood-years.

Year.	Amount of Pack.	Combined Packs of Brood-years.
1913	52,000	227,000 (1908. 1909.)
1916	60,000	223,000 (1911. 1912.)
1917	65,000	145,000 (1912. 1913.)
1912	92,000	248,000 (1907. 1908.)
1915	116,000	318,000 (1910. 1911.)
1914	130,000	275,000 (1909. 1910.)

With the exception of 1917, a close correspondence is seen in this table between the size of catch each year and the combined catches of the two brood-years. It is significant that the three years having the largest packs of sockeyes also had the largest brood-year packs. If further statistics of this kind are in general reliable—it is much too early yet to make sure that they will be so—it may be possible to predict several years ahead with some degree of success. The pack of 1918 will have 1913 and 1914 for its brood-years, and their combined packs amount to 183,000 cases. If this has any significance, we can expect the pack of 1918 to fall at some point between 50,000 and 75,000 cases. If, on the contrary, it shall turn out to be far larger than this, 100,000 cases or more, we would be compelled to admit that this method promises nothing in the way of useful forecast. The year 1917 exhibits a marked discrepancy. On the basis of its ancestral strength we should have anticipated a much smaller take of salmon than occurred.

We have included in this discussion, as in our previous reports on the Skeena River, only that group of salmon which as fingerlings migrated to the ocean after having lived one entire year in the lake. The group that proceeds to sea one year earlier as fry has been omitted because neither here nor elsewhere is it represented by a large enough number of individuals to give it any commercial significance. But the group that spends two full years in the lake before undertaking its voyage to the sea is sometimes of great importance. Its importance in the Skeena varies from year to year. Thus, in 1914, 7 per cent. of the run belonged to this group, and in 1915 over 15 per cent. had spent two years in the lake. In 1916 the average number amounted to 27 per cent., and in 1917 to 14 per cent., and in each case a portion of the group had remained three years in the sea and were maturing at the age of five, while the others had spent an additional year in the ocean and were in their sixth year when captured. In the majority of streams in which the two-years-in-lake group is abundantly represented the five-year members greatly outnumber the six-year individuals. But in the Skeena River in 1916 the reverse was the case throughout the season until the August run was on, when a sudden increase occurred in the five-year fish (two-years-in-lake type), while the other three groups continued to run in their previous proportions. The change occurred suddenly and did not form part of that general and regular shifting during the progress of the run that changed materially the proportions of four- and five-year fish, of males and females. The sudden accession of five-year fish of the two-years-in-lake type in the Skeena run in August was more probably due to the late-running fish belonging to some other tributary in which this group of sockeyes more largely predominate. The following table gives the percentage of fish in each of the four groups as these were found on different dates through the season:—

Table XXXIX.—Percentages of Different Age-groups, Skeena River Sockeyes, found to constitute the Run on a Succession of Dates, Season of 1916.

Dates, 1916.	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
June 21	20	32	22	26
June 30	30	39	11	20
July 11	38	38	7	17
July 18	34	42	8	16
July 22	36	47	8	9
July 27	39	43	5	13
July 31	47	40	6	7
Aug. 4	30	24	37	9

Table XL.—Percentages of Different Age-groups, Skeena River Sockeyes, found to constitute the Run on a Succession of Dates, Season of 1917.

Dates, 1917.	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
June 26	37	41	12	10
July 3	41	45	9	5
July 7 and 10	69	25	4	2
July 13 and 19	70	20	9	1
July 24	78	12	8	2
Aug. 3	46	32	14	8

Certain distinct tendencies are evident in these tables, exhibiting consistent movements throughout the season, until the August run comes in, which proves an exception to all that has happened previously. Considering, for example, the relative numbers in the two primary groups, which we segregate in the following tables:—

Table XLI.—Relative Numbers in One-year-in-lake and Two-years-in-lake Groups, Skeena River Sockeyes, 1916, on a Succession of Dates.

Dates.	One Year in Lake.	Two Years in Lake.
June 21	52	48
June 30	69	31
July 11	76	24
July 18	76	24
July 22	83	17
July 27	82	18
July 31	87	13
Aug. 4	54	46

Table XLII.—Relative Numbers in One-year-in-lake and Two-years-in-lake Groups, Skeena River Sockeyes, 1917, on a Succession of Dates.

Dates.	One Year in Lake.	Two Years in Lake.
June 26	78	22
July 3	86	14
July 7 and 10	94	6
July 13 and 19	90	10
July 24	90	10
Aug. 3	78	22

From the above tables it appears that fish which had spent two years in fresh water before seeking the sea, and which were one year older, though scarcely larger, than those members of the one-year-in-lake group which had spent an equal period of time on the sea-feeding grounds, show a decided tendency to enter the river earlier in the season than do those of the other group. The regularity with which this change proceeds throughout the run recalls a similar series of percentages which express the fact that the five-year fish show a tendency to precede the four-year fish, and the males to precede the females.

In each of the above cases the reason for the observed precedence appears to be the same, and is concerned with the existence of some influence which hastens maturity. In the case of those individuals which have spent two years in the lake, we have the additional year of life, which has added little or nothing to their stature and which exercises only a subordinate influence on their maturing. But the influence, although subordinate, is unmistakable. For although as a group it takes them a year longer to mature, so that they enter the stream at spawning-time five and six years old instead of four and five, nevertheless the additional year of life modifies the percentages of five and six, so that ordinarily a much larger percentage of this group matures at five than matures at four in the other group. The pull of the extra year of life is felt slightly in the direction of hastening maturity. It is this same influence, we take it, which brings them into the river earlier in the season.

In the case of the males preceding the females, we have again an unmistakable influence leading to early maturing. It is known in all the species of salmon that certain males, called grilse, will mature one year younger than any of the females ordinarily will mature. We have also called attention to the fact, in the Rivers Inlet race and elsewhere, that heavy percentages of four-year fish may be males and equally heavy percentages of five-year fish may be females. All these facts are expressions of the one tendency toward early maturing on the part of the males.

One further segregation of the age-groups remains to be made for comparison on a succession of dates. Those that had spent three years on the sea-feeding grounds should be compared with all those which had spent four years at sea, whatever their early history, to ascertain whether there had occurred during the season any progressive change in the relative abundance of the two groups. The percentages follow:—

Table XLIII.—Percentages of Skeena River Sockeyes on Different Dates during Season of 1916, having Equal Number of Years on the Sea-feeding Grounds.

Dates.	Three Years in Sea, Four and Five Years old.	Four Years in Sea, Five and Six Years old.
June 21	42	58
June 30	41	59
July 11	45	55
July 18	42	58
July 22	44	56
July 27	44	56
July 31	53	47
Aug. 4	67	33

Table XLIV.—Percentages of Skeena River Sockeyes on Different Dates during the Season of 1917, having Equal Number of Years on the Sea-feeding Grounds.

Dates.	Three Years in Sea, Four and Five Years old.	Four Years in Sea, Five and Six Years old.
June 26	49	51
July 3	50	50
July 7 and 10	73	27
July 13 and 19	79	21
July 24	86	14
Aug. 3	60	40

The remarkable uniformity in the series of percentages in 1916 stands in sharp contrast with the progressive changes which are seen in the 1917 record, and which occur in all the other categories which we have examined. We consider the 1917 condition the typical one, in which the older fish will tend to run heaviest early in the season. But both in 1916 and 1917 the orderliness of the season is wholly interrupted and broken in upon where the August run appears. It seems the latter must be a thing apart, a body of fish bound for some spawning-grounds probably less distant from the sea than is the case with the earlier run.

(2.) RELATIVE NUMBERS OF MALES AND FEMALES.

We have no records of relative numbers of males and females of the two-years-in-lake group prior to 1916. It was unexpected to find in both 1916 and 1917 a preponderance of males both in the five- and in the six-year fish of this group. They seem to comport themselves in precisely the same way as the four-year fish of the one-year-in-lake group. The reason for this is not at all apparent, and the fact needs verification over a term of years in the Skeena, and with the same group of sockeyes in other river-basins. In the one-year-in-lake group it is very noticeable that the four-year fish vary widely from year to year in the proportions of the sexes, while the five-year fish are remarkably constant, the proportion of males varying only 6 per cent. in six years.

Table XLV.—Relative Numbers of Males and Females in Different Year-groups, Skeena River Sockeyes, in a Series of Years.

Years.	One Year in Lake.				Two Years in Lake.			
	Four Years old.		Five Years old.		Five Years old.		Six Years old.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1912	54	46	42	58	..	..	..	..
1913	69	31	47	53	..	..	..	..
1914	60	40	47	53	..	..	..	..
1915	55	45	45	55	..	..	..	..
1916	70	30	43	57	56	44	54	46
1917	65	35	48	52	65	35	58	42

(3.) Lengths and Weights.

In our report for 1914 (page 67) we have called attention to the obviously smaller size in 1913 of all the classes of fish, the smaller measurements being supported by the smaller average weights taken during the same season. In no other year previous to 1917 have we found a similar falling-off in the size of all groups, thus indicating the existence of some generally unfavourable condition. Minor variations occur in one or the other group in various years, such as the large size of the males compared with the females in 1912, and the unusually small size of the four-year males in 1916. But in both instances cited the measurements of the remaining groups are normal. In 1917, however, a combination appears which almost exactly repeats that of 1913. The averages of the five-year fish of both sexes are identical. The four-year males differ by only $^1/_{10}$ inch, and the four-year females by $^3/_{10}$ inch. Each of the 1917 averages is lower than that of any other year except 1913.

Table XLVI.—Average Lengths of Skeena River Sockeyes, One Year in Lake, for Six Successive Years.

	1912.	1913.	1914.	1915.	1916.	1917.
Four-year males	24.6	23.5	24.2	24.2	23.9	23.6
Four-year females	23.5	22.9	23.4	23.5	23.6	23.2
Five-year males	26.4	25.5	26.2	25.9	26.2	25.5
Five-year females	25.2	24.7	25.1	25.0	25.0	24.7

Table XLVII.—Average Lengths of Skeena River Sockeyes, Two Years in Lake, for Two Successive Years.

	1916.	1917.
Five-year males	24.1	23.9
Five-year females	23.8	23.8
Six-year males	26.2	25.4
Six-year females	24.8	25.0

That this signifies some generally unfavourable condition in the ocean becomes almost a certainty when we recall that the 1917 evidence on the Skeena is exactly comparable with that previously noted in this report for Rivers Inlet. As is there shown, the sizes of each group of Rivers Inlet sockeyes in 1917 was far below the average size, and there, as on the Skeena, the catch of the previous year was up to the normal as regards the average size of its individuals. As is shown by the following table, the average weight for each group of Skeena River sockeyes in 1917 was below that of the same group in 1916. The weights of the two-years-in-lake groups are less reliable than the others because of the smaller number of individuals represented.

Table XLVIII.—Average Weights, Skeena River Sockeyes, for Four Successive Years.

	1914.	1915.	1916.	1917.
One Year in lake—				
Four-year males	5.9	5.7	5.4	5.3
Four-year females	5.3	5.2	5.1	5.0
Five-year males	7.2	6.8	7.1	6.4
Five-year females	6.3	6.2	6.3	6.0
Two Years in lake—				
Five-year males	..	5.9	5.8	5.5
Five-year females	..	5.2	5.4	5.2
Six-year males	..	6.6	7.08	6.3
Six-year females	..	6.0	5.9	5.8

VI. THE SOCKEYE RUNS IN THE NASS RIVER, 1916 AND 1917.

The Nass River has experienced fewer and less extensive fluctuations in the size of its salmon runs than has any other district in British Columbia. The lowest pack of sockeyes since 1907 has been 23,574 cases, in 1913, and the highest 39,349 cases, in 1915. The average for the decade is 30,785 cases. In 1916 the Nass was fully up to its recent average, with 31,411 cases of sockeyes; while the Fraser, the Skeena, and Rivers Inlet agreed in having almost unprecedentedly poor runs. Not one of these three rivers put up half a pack, and with the single exception of the year 1913 on the Skeena, the year 1916 was the worst in the recent history of the industry. But the Nass was unaffected. While there is reason to fear that the other principal streams of the Province are beginning to experience the effects of overfishing, the lower levels of the fluctuations in the runs becoming lower and the higher levels less high, there seems to be no indication so far that the Nass River has suffered.

In 1917, it is true, the catch of sockeyes for the Nass declined greatly, comprising only 22,188 cases. It was thus the worst year for the past decade, the pack standing even a little below the year 1913, which is otherwise unrivalled in this respect. We search in vain for anything in the past history of the Nass that can explain these years. The river is predominantly a five-year stream. While sockeyes are mature in the Nass run at all ages from two to seven, two classes mature at five, one of them after spending one year in fresh water and four years at sea, the other after two years in fresh water and three years in the sea. Each of these two classes is larger than any other of the numerous groups in the Nass, and the two together constituted at different times during the season of 1917 from 61 to 96 per cent. of the run, with an average for the entire run of 82 per cent. In so far, then, as the principal brood-year on the Nass is concerned, we must turn to the fifth year preceding. But the brood-year for 1917 (1912) stands third in order of productiveness for the river, with a pack of 36,037 cases; and the brood-year for 1913 (1908), with a pack of 27,584 cases, was the best the river had known up to that date. We are compelled, then, to assume either that the size of the pack gives no reliable indication of the number of fish that reach the spawning-grounds, or that some adverse influences subsequent to spawning hindered the productiveness of the basin during those two years. Such adverse influences might operate during the one or two years residence in the lake or during the three or four years life in the ocean. They might consist of adverse physical conditions, of unusually prevalent disease, of superabundant enemies, or of scarcity of food. As an example, in 1915 we found some 10 per cent. of the migrating yearlings in Rivers Inlet infested by a parasite copepod (*Salmincola falculata*), "which seemed absurdly large for the fingerling to carry about and nourish." Sometimes two or even three of these parasites attacked the same individual, and some of these were obviously stunted in consequence. What proportion of the fingerlings may have succumbed to these attacks we have no means of knowing. The mortality might be very great. In pond-culture of trout it is considered essential to remove these parasites once or twice in the year in order to save the brood, yet the trout may weigh a pound or more and the fingerlings only as many ounces. The interesting fact in this connection is that the parasites are much more abundant and destructive in some years than they are in others. While very numerous in Owikeno Lake, Rivers Inlet, in 1915, they were much less so in 1914, and there was an almost complete absence of them in 1916. This is one of many factors which may materially diminish the productiveness of a brood-year, even when the spawning-grounds are well supplied and a large hatch of fry results.

It is clear, then, that we may occasionally have a year of unusual destructiveness to fry during their year or two of sojourn in their native lake. But such effects as these are likely to be local in their influence. The parasite we have mentioned was present in no unusual abundance in 1915 in the Smith Inlet Lake, although this is not far distant from Lake Owikeno. If Rivers Inlet should have a poor run in 1919, we might with some degree of propriety recall the ravages of the parasite in Lake Owikeno in the winter of 1914-15. But if Smith Inlet should also have a poor season in 1919, we must look elsewhere for a cause. And if practically all the sockeye streams on a stretch of coast agree in having greatly reduced runs in a given year, without regard to the size of the runs in their preceding brood-years, we shall do well to look for some effective agency which has operated generally during their life in the ocean, when all are equally exposed to it.

The two conspicuously poor years in the recent history of the Nass, 1913 and 1917, are of this nature. On the Fraser, 1913 was the big year of the cycle and cannot be cited in this connection. But on the Skeena, to find as small a pack as in 1913, we must go back to the exceptionally poor year 1903; on Rivers Inlet there is no year so poor since 1897, and on the Nass none so poor since 1907. As for 1917, the other poor year we have cited for the Nass, we must again eliminate the Fraser from the discussion. For 1917 was to have been the big year of the cycle on the Fraser, and the causes which prevented were wholly local in their operation and could have no bearing on a general failure in other districts. But in Rivers Inlet the pack was slightly poorer even than in 1913; on the Skeena it was but little better than 1913; and on the Nass, as we have already seen, it was even worse than 1913.

We might consider these perhaps as mere coincidences, without significance, were another factor not involved. The records for 1913 and 1917 indicate unmistakably that the spawning fish of those years were below normal size in all the rivers mentioned, except perhaps Rivers Inlet in 1913. In our report for the year 1914 we call attention to the smaller size of individuals in every group for 1913 (pages 67, 73), both on the Fraser, the Skeena, and the Nass, and discuss the possible significance of this fact. As we there state (page 73): "If those [i.e., the records] for Rivers Inlet had coincided with these [the Fraser, Skeena, and Nass], we should have had no hesitation in assigning as a cause some widespread oceanic conditions unfavourable to the sockeyes of the 1913 run. And, indeed, this seems now the most probable hypothesis." And now the same phenomenon has been repeated in 1917. We have extremely poor packs of sockeyes in all the large rivers of the Province, and we have these poor runs consisting everywhere of undersized fish. Clearly certain "widespread oceanic conditions unfavourable to the sockeyes" must be involved.

What these unfavourable conditions are we may not be able to determine, except perhaps in part. They cannot have operated over any considerable part of the life of the 1917 fish, for the 1916 runs were unaffected as regards the size of the individual fish, although the magnitude of the runs themselves was greatly reduced on the Skeena and on Rivers Inlet. But whatever causes dwarfed the 1917 individuals must have operated after the 1916 fish had ceased feeding and had schooled up for their spawning run. The last of these, however, left their feeding-grounds late in the summer, when most of them had begun the formation of what we call the "winter-check" at the margins of their scales; this check being an area marked by very fine crowded ridges which indicate the slowing-down of growth, preparatory to its almost complete cessation during the winter months. But as the late summer migrants of 1916 were still of normal size, we are forced to conclude that as yet the 1917 brood had suffered no reverse. Up to the period of cessation of growth in the late summer of 1916 we must figure the 1917 brood as flourishing in the customary fashion for sockeyes. There remains to be considered only the growth-period in the spring. After the winter's rest this sets in suddenly and with great vigour. The scales show no rings of intermediate spacing between the narrowly crowded "winter-band" and the widely separated "summer-rings." If the winter's period of quiescence slowly and gradually gave place to renewed vigour, the intermediate condition would be plainly marked on the scales. We must imagine, then, a sudden accession of growth-vigour whenever the conditions in the spring become favourable. There is variation in this respect among the various individuals, and, in addition to that, the age-groups react differently. Three-year fish start their new growth before those a year older, and a little later the four-year fish show rings of new growth at the margins of their scales at a time when the five-year fish have the margins of their scales still formed by the winter-band of fine rings. Observations in early-running sockeyes have demonstrated that, even among four-year fish, growth ordinarily does not begin until some time in May. The exact date differs doubtless with the seasons. A cold, backward spring may well cause it to be considerably retarded. Some seasons are several weeks or a month behind the average. Reduced temperatures in the surface waters where the sockeyes feed may well react on them directly, or indirectly through their food, and their growth be thus so far retarded that they are unable to make up the deficiency in the few weeks of feeding left to them. Inquiry into the climatal conditions in the spring of 1913 and 1917 may throw light on the above hypothesis.

It is not apparent what connection a backward spring could have with a greatly reduced run throughout the area affected. The reduction in the size of the individual fish might reduce the pack 10 to 15 per cent., even should the number of individuals be as great as in normal years. Contributing to that loss we have the decreased size of the fish, and also the increased percentage

of waste in butchering the smaller sizes. But 10 or 15 per cent. reduction will not account for packs which may be only half or a third their normal size. Further observations are necessary to determine whether a greatly reduced pack always accompanies a year of undersized fish, or whether the two conditions occur independently.

The following table, comparing the average lengths and weights for 1916 and 1917 of all the different classes of sockeyes running in the Nass, shows conclusively the smaller size of all groups in 1917. The records thus tabulated in this report are based on observations made by the Fishery Overseers stationed in this fishing district. They are fairly accurate, but show obvious discrepancies when subjected to close scrutiny. A portion of these possibly may be attributed to careless observation, but the majority are due to the small amounts of material handled in certain classes. In the table below, the bulk of the run is represented in the two columns of fish five years old. All of the other types, except during certain years the four-year fish, are represented by relatively few individuals, and their averages are the less trustworthy.

Table XLIX.—Nass River Sockeyes, Average Lengths and Weights of Different Classes, Runs of 1916 and 1917.

	Average Sizes of Individuals that spent							
	One Year in Lake.				Two Years in Lake.			
	Four Years old.		Five Years old.		Five Years old.		Six Years old.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1916 (inches)	24.5	23.3	26.4	25.0	26.5	25.7	27.9	25.8
1917 (inches)	23.4	23.2	25.5	24.7	25.3	24.7	26.5	25.5
1916 (pounds)	6.0	5.3	7.2	6.3	7.2	6.2	8.1	6.4
1917 (pounds)	5.3	5.3	6.8	6.2	6.3	5.8	7.3	6.4

	Average Sizes of Individuals that spent									
	Three Years in Lake.				No Year in Lake. (Sea-type.)					
	Six Years Old.		Seven Years old.		Two Years old.		Three Years old.		Four Years old.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1916 (inches)	26.4	26.5	...	...	...	...	...	...	26.1	24.2
1917 (inches)	25.8	25.4	26.0	...	...	22.5	23.4	...	24.8	23.8
1916 (pounds)	7.3	6.6	...	...	...	...	...	...	7.1	6.0
1917 (pounds)	6.8	6.1	7.0	...	...	5.0	5.1	...	6.0	5.7

We do not in this table segregate the August-running fish for separate treatment, as was done in the report for 1915. It was found during that year that the run was sharply divided in an early and a late period, the August fish being distinctly larger, comprised almost exclusively of five-year fish of the two-years-in-lake type, and with distinctively marked nuclear areas on their scales. Apparently, in 1915, one of the sub-races of the Nass ran late and was practically unmixed with others. An occasional opportunity of this kind has presented itself in the Fraser run of a given year, an opportunity which may not be repeated a second year on account of mingling of types. It is a matter of favourable chance when a "pure culture" can be dealt with in any part of a sockeye run, when this is examined in the lower course of any of the larger river-basins.

It was not surprising, therefore, to find in 1916 and 1917 no such sharp separation of the August fish on the Nass as occurred in 1915. The same age-group largely predominated in August of the three years, but no decided increase in size of individuals was apparent and the types of scale nuclear areas present indicated a complete mixture of the two types, which were

well distinguished but did not run separately. As regards sizes, a slight increase was noticeable as the season advanced, and a few of the smaller sizes, ranging from 23 to 25 inches, disappeared in the last of July or the first of August. These sizes were not very numerously represented at any stage of the run, so their loss did not greatly change the averages. The average of five-year males that had as fingerlings spent two years in fresh water, for the entire season of 1917 was 25.3 inches; for the August portion of the run was 25.5; for the June and July portion of the run, 25.2. Confining our attention to the dominant type, which in 1915 had exhibited the greatest increase in the August portion of the run—consisting of five-year fish, two years in the lake—we make the following comparison of the June-July and the August portions of the run for 1916 and 1917:—

	June-July.		August.	
	Males.	Females.	Males.	Females.
1916 (inches)	26.4	25.7	26.7	25.8
1917 (inches)	25.2	24.7	25.5	24.9

The records obtained of the run of 1916 includes eleven dates, covering the period from June 20th to August 18th. In 1917 a similar series embraces seventeen distinct records, extending from June 26th to August 23rd. These are fairly evenly spaced and are usually three or four days apart. They give us the most complete account we have had heretofore of any sockeye run, and show clearly what internal changes occur in the run among the various groups and classes of which it is composed. In the following tables are given separately for 1916 and 1917 the varying proportions in which the age-groups were represented in a succession of dates throughout the runs. Comparison of the two tables will show that, although the exact proportions differed in the two years, the general movements followed each other closely. Both four- and five-year fish of the one-year-in-lake group ran in small numbers at the beginning and at the close of the run, and culminated about the middle or latter part of July. The predominant group—five-year-old, two years in lake—had much the largest percentages in the early and later portions of the run and less during the middle of July. The six-year class, two years in lake, ran from the early part of July into August, but was most abundant in the later portion of the run. This tendency was still more definitely marked in the six-year type that had lived three years in the lake. These do not appear until August, and increase during the last days of the run. The remaining class, the sea-type, which spend no time in fresh water after they are hatched and become free-swimming, have the reverse habit to those just described which spend three full years in fresh water. The Nass River sockeyes of sea-type enter at the beginning of the run, few of them appearing after the middle of July. In these cases we must discriminate between events of universal occurrence in all the rivers and those of local occurrence due to the special conditions existing in a given river. Whether a group of sockeyes enters a river in the earlier or the later portion of the run seems to depend on two factors. One of these is the innate tendency for a given group to mature earlier than some other group. This will be universally expressed, and will determine in general the order in which the majority of a group will enter the river, unless the second factor is operative. The latter has to do with the special part of the river-basin toward which any group is mainly directing its course. If it is equally distributed throughout the spawning areas, this factor would be in abeyance. But such is not always the case. In the Fraser River there are reasons for believing the individuals of sea-type spawn principally in the lower course of the stream. That may be the reason they always enter the stream in the last part of the run, a procedure the exact opposite of that which occurs on the Nass.

Table L.—Percentages in each Class of Nass River Sockeyes running at Different Dates in 1916.

1916.	One Year in Lake.		Two Years in Lake.		Three Years in Lake.		Sea-type.	
	Four Years.	Five Years.	Five Years.	Six Years.	Six Years.	Seven Years.	Three Years.	Four Years.
June 20	2	16	74	..	..	..	..	8
June 22	2	..	96	..	..	..	..	2
June 28	6	4	88	2	..	..	..	..
July 11	8	33	55	2	..	..	..	2
July 13	12	34	42	12	..	..	..	..
July 15	18	29	39	10	..	..	..	4
July 25	19	25	46	10	..	..	..	..
July 27	12	19	53	16	..	..	..	..
Aug. 1	14	9	61	14	2	..	..	..
Aug. 10	2	2	75	11	10	..	..	..
Aug. 18	3	..	82	9	6	..	..	..

Table LI.—Percentages in each Class of Nass River Sockeyes running at Different Dates in 1917.

1917.	One Year in Lake.		Two Years in Lake.		Three Years in Lake.		Sea-type.	
	Four Years.	Five Years.	Five Years.	Six Years.	Six Years.	Seven Years.	Three Years.	Four Years.
June 26	..	14	82	..	..	..	..	4
June 27	4	8	82	..	..	..	4	2
June 30	2	15	72	..	..	..	9	2
July 2	4	18	74	2	..	..	2	..
July 5	..	26	66	2	..	..	2	4
July 9	16	42	52	2	..	..	..	2
July 13	26	22	62	..	..	..	..	..
July 19	31	28	40	4	..	..	..	2
July 20	16	20	41	8	..	..	..	..
July 25	24	21	57	6	..	..	..	..
July 27	8	20	50	4	..	..	..	2
July 30	8	12	72	8	..	..	..	..
Aug. 2	8	..	81	6	4	..	..	..
Aug. 6	8	..	90	..	2	..	..	..
Aug. 9	2	2	80	8	8	..	..	..
Aug. 22	2	..	80	2	16	..	..	..
Aug. 23	..	..	71	6	23	..	..	..

Specimens examined August 24th, 1917, are not listed, as the peripheral portions of the scales had suffered too much for successful age-determination in many cases. There was included one undoubted seven-year specimen which had spent three years in the lake and four at sea—the third of this class to be discovered in the Nass. It was a male 28 inches long, weighing 8 lb.

The Nass is noted for the large number of different age-groups and other classes which it contains. Eight of these are now reported, an additional one being recorded in the 1917 run, comprising three-year-olds of sea-type, seven individuals of which ran in the earliest portion of the run, none later than July 5th. All of these were males, while the majority of the four-year fish of the same type were females. The only known group of sockeyes unrepresented from the Nass are the three-year male grilse.

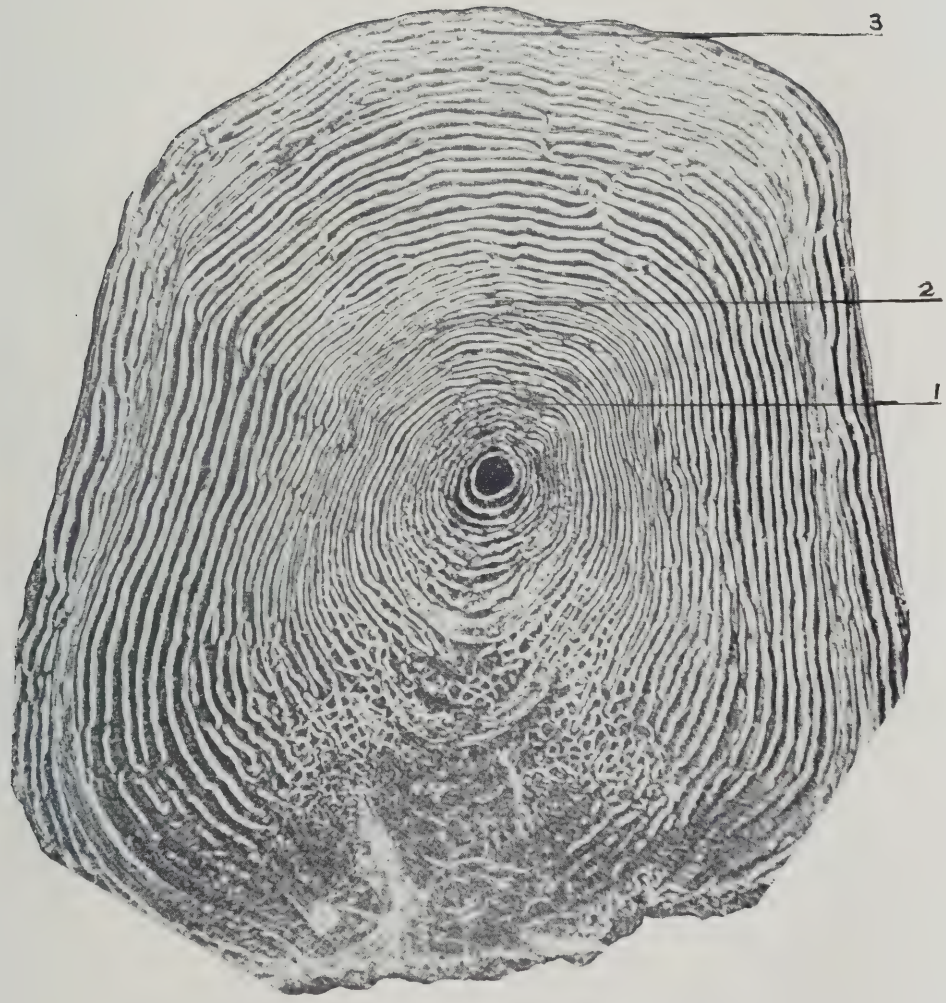


Fig. 1. Fraser River sockeye from the Birkenhead River. Female, 23 inches long, in fourth year. Taken September 26th, 1916.

Fig. 2. Fraser River sockeye from the Birkenhead River. Female, 23 inches long, in fourth year. Taken September 26th, 1916.

Fig. 3. Fraser River sockeye from Cultus Lake. Female, 23½ inches long, in fourth year. Taken November 9th, 1916.

Fig. 4. Fraser River sockeye from Morris Creek. Female, 23½ inches long, in fourth year. Taken October 17th, 1916.

Fig. 5. Fraser River sockeye from Pitt Lake. Female, 24 inches long, in fifth year. Taken September 25th, 1916.

Fig. 6. Fraser River sockeye taken at Harrison Rapids, September 30th, 1916. Male, 25½ inches long.

Fig. 7. Fraser River sockeye taken at Harrison Rapids, September 30th, 1916. Male, 25 inches long.

Fig. 8. Fraser River sockeye taken at Harrison Rapids, September 30th, 1916. Male, 26½ inches long.

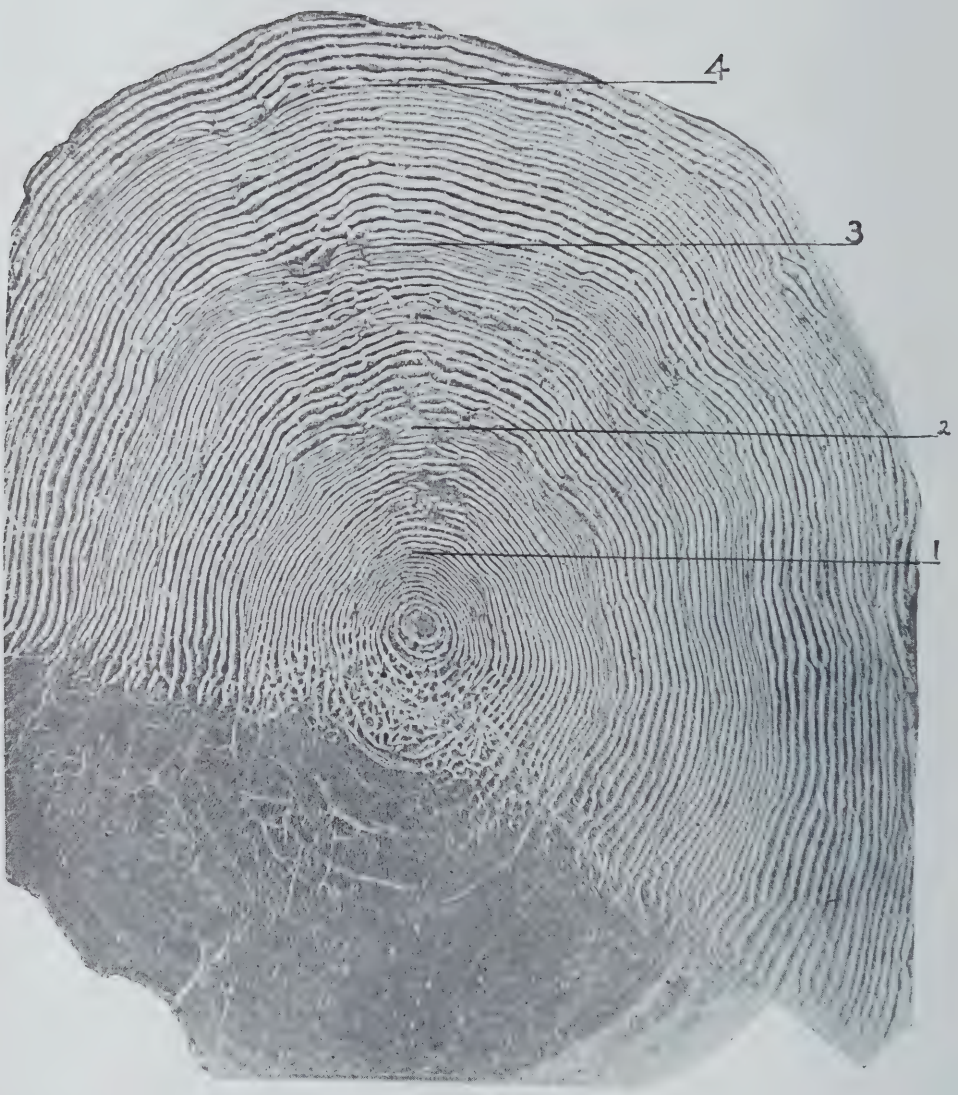


Fig. 9. Fraser River sockeye, Bellingham, July 22nd, 1917. Female, 23 inches long, in fifth year.

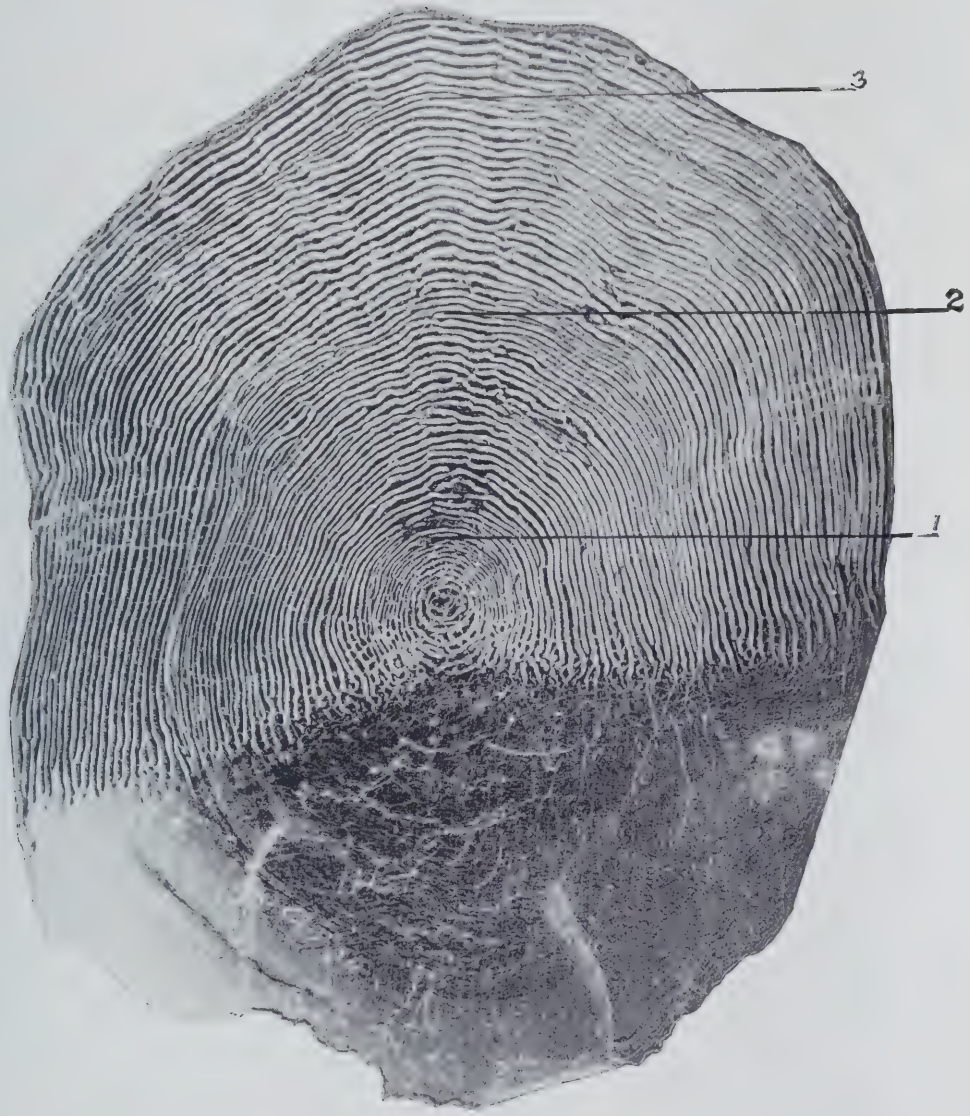


Fig. 10. Fraser River sockeye, Bellingham, Wash., August 23rd, 1917. Male, 25 inches long, in fourth year.

Fig. 11. Fraser River sockeye, Bellingham, Wash., August 10th, 1917. Female, 24½ inches long, in fourth year.

Fig. 12. Fraser River sockeye, Bellingham, Wash., June 18th, 1917. Female, 23 inches long, in fifth year.

Fig. 13. Fraser River sockeye, Bellingham, Wash., July 13th, 1917. Female, 22½ inches long, in fourth year.

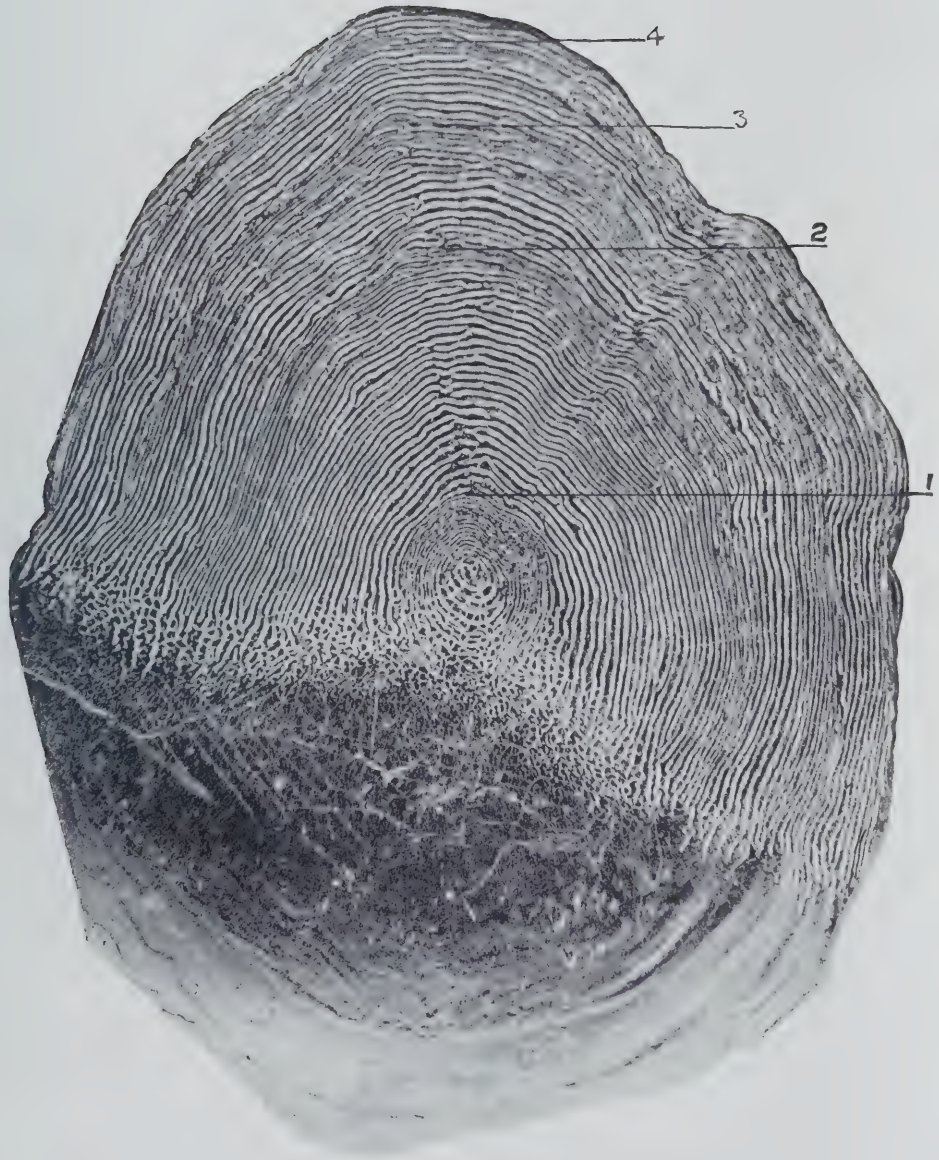


Fig. 14. Rivers Inlet sockeye of very unusual type, originally considered a straggler from some other stream. Male, 23½ inches long, in fifth year. Taken June 27th, 1916.

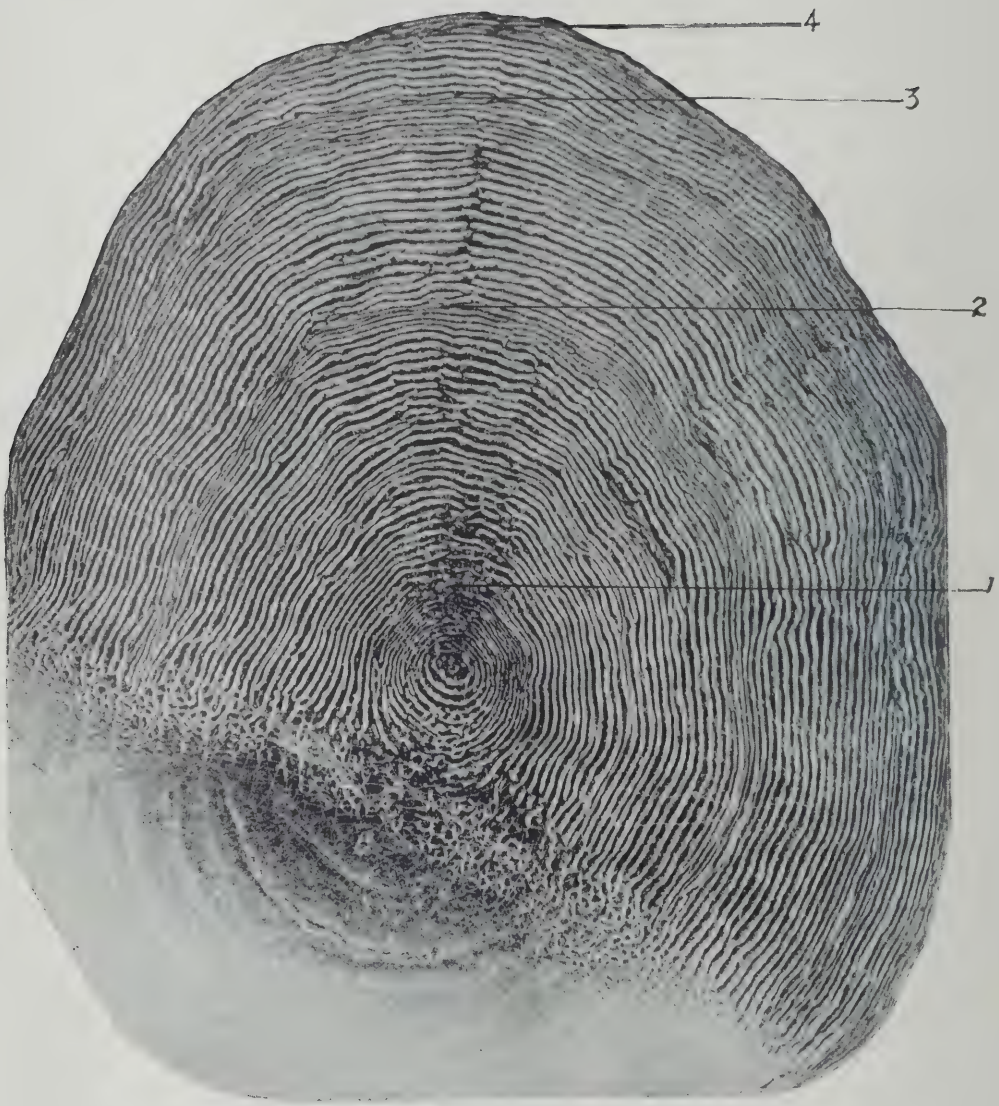


Fig. 15. Rivers Inlet sockeye of very unusual type, originally considered a straggler from some other stream. Female, 24 inches long, in fifth year. Taken June 27th, 1916.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE PACIFIC COAST EDIBLE CRAB.

(Cancer magister.)

(No. 3.)

By F. W. Weymouth, Assistant Professor of Physiology, Stanford University.

Introduction.

In previous papers in these reports (1914, 1915) certain general features of the life-history of the edible crab, especially those bearing directly on its distribution and affecting the manner of fishing, were briefly discussed and a description given of the crab-fishery of British Columbia, its methods, and the conditions at the more important points. The present paper has little to add to the account already given of the industry in the Province, the field-work of 1916 and 1917 having been confined to Crescent, where, as stated in the report for 1914, a crab-fishery of considerable importance is maintained, the grounds lying in Boundary Bay, only a short distance north of the International Boundary. This restriction of the field-work was found advisable, as it had been learned that the differences between different localities (and, I may add, between successive seasons) were so great that the data from them could be combined only with extreme care. Since it was apparent that intensive work in a single locality was most likely to yield fruitful returns, and since Crescent presented several features of advantage, chief among which was the opportunity of obtaining material offered by the fishery there (to the proprietor of which, H. M. Frazer, I wish again to acknowledge my indebtedness for many and continued courtesies), the time available, July 21st to 27th, 1916, and June 19th to September 4th, 1917, was spent here. The effectiveness of this work has been much extended by collections made under the writer's directions by Charles V. Sayer, of New Westminster, during the fall and winter of 1917-18. The data thus obtained, which is the most complete that has yet been available, bears on a number of points in the life-history of the crab, but consideration of certain of these questions has not gone far enough to permit of their inclusion in the present report. Some facts bearing on problems of cooking and marketing, notably those of "light" and "black" crabs, will be presented; new data on the relation of width to weight and the loss of weight in cooking is given; the dates of appearance of the larvæ and a consideration of the cause of seasonal variation in this is taken up.

Cooking Methods; "Light" and "Black" Crabs.

In connection with the cooking and preparing for market of the crab, certain problems were called to my attention which I shall here present briefly, with such data as an incidental study has brought to light.

The crabs are usually shipped from the fishing-grounds alive and cooked by the wholesaler in the city where they are to be sold. The method of cooking is commonly as follows: The crabs, as received, are dumped into a large tank of boiling salted water and allowed to boil for twenty to thirty minutes and then removed and cooled in running cold water. If destined to be retailed through local markets, and this includes most of the crabs handled in Vancouver, they are cleaned, usually by scrubbing in the cooling-tank, and set to drain until called for by or shipped to the retailer.

The retailer, from his experience with the ultimate consumer, is guided in his choice of crabs chiefly by three factors. "Cripples," particularly those in which the large pincers or chelipeds are missing, are rejected because of the smaller amount of meat present and because of the appearance, the pincers being the most attractive part when served as cracked crab. Those discoloured or disfigured by many barnacles are refused on the ground of unattractive appearance. In the third place, the crabs are "hefted" and the "light" crabs, those in which the

weight appears disproportionally small for the size, are rejected. As these rejections mean a loss to the wholesaler or fisherman, and if the crabs rejected spoil or are thrown away, a food loss to the community, it is worth while to consider if these rejections are just, and, if just, in how far the conditions causing them may be avoidable. I will consider them in the above order.

The crabs in which legs are missing represent a decreased amount of meat, and will naturally be refused by any prudent buyer as long as the crabs are sold at a fixed price "a piece" or with only a rough classification into large, medium, and small. The remedy for this is the introduction of the rational practice of selling by weight, which has been gaining ground of late years in the handling of other foodstuffs. If the purchaser paid for the weight received, the "cripples," which unavoidably result from the packing and shipping of the crabs, could be disposed of almost as readily as the perfect crabs.

Crabs with an encrustation of barnacles or other marine growths are not by this fact injured for food, and if properly cleaned can be rendered more attractive. The use of a brush with steel-wire bristles instead of the ordinary "corn" or fibre brush, for instance, will often clean what would otherwise be unattractive crabs. The presence of many barnacles is, however, an evidence of a long period since the last moult and may thus incidentally indicate a condition not so favourable for food, as will be pointed out shortly, and therefore it would probably be best for the fisherman to return to the water the extremely "dirty" crabs, as they are called, that they may have an opportunity to moult and improve both in appearance and food value.

A related question is that of "black" crabs. Often after cooking the back or carapace of the crab, instead of being uniformly red, will show areas which are black, or at least dark, and which so injure the appearance of the crab as greatly to interfere with its sale. Worms were assigned as the cause of this discoloration by one old fisherman, who, as proof, held up the crab-shell to the light and pointed out minute "worm-holes" in these regions. Very fine holes, or more often thin places which resemble holes, are, indeed, often present, but are not due to worms. If the surface of the shell is closely examined it will be seen to be thickly studded with small, round, boss-like projections, and corresponding to each on the inner surface will be found a tiny pit. When the shell is much worn it is, of course, the projections which suffer first, and the shell in consequence becomes thin in these places, and if the wear goes far enough to reach the pits, actual holes will be produced, quite without the agency of "worms." Certain regions near the centre of the shell, particularly that known as the gastric area, are above the general level of the remaining surface and hence most exposed to wear, and it is these which are most often black. That the discoloration is due to the injury to the shell in these regions is shown by the fact that all injuries, breaks, holes, and the like, develop black areas about them. When due to mere superficial injury the food value of the crab is not affected, and there is no reason, other than the æsthetic, for their rejection. There is no way in which the blackening can be avoided, though, if slight, it may be removed, at least partially, in cleaning.

There remains the more serious problem of "light" crabs. In this it is necessary to distinguish carefully between those crabs which show a weight disproportionally small while living and those in which the same condition obtains after cooking, for while an individual may be "light" both before and after cooking, this is not always the case. In an attempt to determine this point a series of seventy-six crabs were carefully weighed and measured while living, labelled to permit their identification, and after cooking again weighed and measured. Under ordinary conditions the crabs are allowed to drain overnight, but this was not possible, and the weights were taken after draining about thirty minutes. For this reason the loss might be expected to be less than the true figure. Seven showed a slight gain, the remaining sixty-nine, losses up to 14 per cent., the average of the whole being a loss of 4.27 per cent. A careful study of the records failed to show any correlation between the condition of the live crab and the amount of loss in weight, the light crabs losing about equally with the heavy ones.

Having indicated the degree of the loss and the fact that this seems to be independent of whether the crab was above or below average weight when alive, let us consider the possible causes of light weight in the cooked crab. If, for instance, a leg is lost and there is much bleeding either before or during cooking, the weight will be correspondingly small. Such cases

are, however, readily recognized and apparently not of great importance, and I shall confine my attention to those cases where the light weight is due to some unusual condition of the tissues of the crab before cooking. The cooking will, of course, coagulate those parts of the blood and tissues which are coagulable, but the mere surplus water will in large part be lost in draining.

Now, those crabs which have recently moulted and in which hardening is incomplete are, as I have pointed out elsewhere,* light in weight and inferior for food. A full consideration of the problem involves the entire question of moulting, but the more pertinent facts may be presented here. In moulting, the weight of the emerging crab, that is, the weight of the hard crab less the weight of the cast shell, may be doubled within an hour. This is not, of course, true growth in the sense that new tissues are built up, but is due to water which is taken up through the alimentary canal and finds its way into the blood.† Since the volume of the blood before moulting may be 5 per cent. of the body-weight,‡ this will have risen to 50 per cent. or in some cases more after moulting. A relatively small amount of this blood is coagulated by boiling, and consequently as much as half of the original weight of the crab may be lost as water. In fact, such freshly moulted crabs are spoken of as "empty" because on opening the cooked specimen little is seen in the shell beyond the stomach and the internal hard parts. Another factor is the liver, which is unusually large at this time, and since it is not eaten the food value is still further reduced. Such crabs should never be brought to the market. If taken they mean a total loss to the fishery, but if returned to the water they are again valuable as food in the course of a month, or at the most two months. In fact, it is hardly necessary to emphasize this point, as the experienced fishermen will not bring in such worthless crabs. Times of great scarcity sometimes tempt the less scrupulous, however, and for these and others who do not of themselves regulate the matter there should be a law fixing a legal degree of hardness or establishing a closed season at the time such crabs are most common.

But even after the careful dealer has excluded the easily recognized "soft" crabs there will be found among the crabs which are completely hard some specimens that are conspicuously "light." Two crabs of the same size from the same "cooking" will serve as an example. Both measured 17.8 cm., and by reference to the graph given in Fig. 1, page 86, it will be seen that the average live weight at this size should be 1 lb. 12 oz. (28 oz.) and the cooked weight 26.25 oz. One of the crabs, No. 5099, selected by the dealer as a moderately heavy one, proved to weigh 25.5 oz., or slightly under the average; it was hard but not excessively old. The other, No. 5064, picked as a "light" crab, weighed 23 oz., or about 3.5 oz. (12.4 per cent.) less than the average, a difference completely supporting the dealer's judgment. The meat was carefully removed from these two crabs and weighed; the complete comparison is as follows:—

No.	Width.	Total Weight.	Meat Weight.	Crab edible.	Waste.	Crab waste.
	Cm.	Oz.	Oz.	Per Cent.	Oz.	Per Cent.
5099	17.8	25.5	11.5	45.5	14	55.0
5064	17.8	23.0	9.0	39.1	14	60.9

It will be seen that, both absolutely and relatively, the amount of meat is greater in the "heavy" crab, the weight of the shell and other waste being the same in the two cases. Some claim in addition that the quality and flavour of the meat in the "heavy" crab is superior. The preference of purchasers for "heavy" crabs needs no further justification.

But this is merely giving figures for facts long recognized by those handling cooked crabs; what are the causes of these differences? The "light" crab (No. 5064) in the case just given was not "soft"; in fact, it was the harder and older of the two as shown by the growth of barnacles and the greater weight of the shell, which when dried and weighed on more delicate scales was found to exceed that of No. 5099 by 6 per cent. We are not, therefore, dealing with

* Report of the Commissioner for 1914, page 125.

† Cuenot, Arch. de Biol., XIII., page 245, 1893.

‡ Paul and Sharpe, Journal of Physiology, L., page 183, 1916.

a recently moulted crab, but, on the other hand, with one again approaching the moulting season, and there is every reason to believe that its "lightness" is connected with changes in the tissues due to the impending moult. As already stated, the liver is large at this time and thus serves to swell the waste. Another and more important factor is present, for the muscles of the legs are seen to be shrunken so as no longer to fill the shell. The advantage of this to the moulting crab is obvious, as the leg when withdrawn from the old shell has to pass through a space at the base much smaller than the leg at its thickest part, a process much facilitated by the shrinkage of the tissues. Whether this loss furnishes some of the material stored in the liver, and by what mechanism the changes are brought about, the data at hand cannot answer. From these considerations it seems clear that crabs about to moult furnish a large part of the "light" crabs, and that it would be wise to return such crabs to the water. Unfortunately they are not easily recognized; it is possible that if a properly timed closed season were established, these, as well as the freshly moulted ones, could be in large measure protected.

An unusual and unexpected result of cooking is a loss in the size of the shell, which is firm and compact enough to give promise of more permanency in this regard. The loss was small, amounting to only 0.44 per cent. in width, but quite constant. This had been suspected by one of the men engaged in cooking from the fact that the number of crabs of a certain size—as, for instance, 7 inches—in a "cooking" often failed to tally after the crabs were boiled.

It may not be out of place while speaking of the food value of the crab to point out that the coagulated blood which is found after cooking collected on the inner surface of the shell, and which is often known as "crab butter," is a highly palatable and nutritious part of the crab and should not be thrown away with the shell.

The Relation of Size to Weight.

In a previous report* a brief summary of the relation of size to weight was given. A more extended consideration based on a larger number of specimens is here presented. The material is entirely from Crescent, as the crabs from different localities appear to vary enough in shape to make inadvisable the combining of data, though it is probable that the relations here established will hold within reasonable limits for the species along the entire coast.

The data is presented in the form of a table (Table 1) and a graph (Fig. 1) based upon it. The width as given is the extreme dimension, including the lateral "points" or "horns," measured with calipers and not over the curve of the back; it does not correspond to the commercial size in which the "points" are not included, so that an average adult male will be about 9.5 mm. (⅜ inch) less when measured in this manner.† The crabs were weighed while living and after the obvious excess moisture had drained off; the weights are recorded in pounds and ounces. The material from 2.5 cm. to 5 cm. represents 229 specimens of both sexes which up to this size show no appreciable differences in weight. The number of specimens for each mm. in width are here great enough to give reliable averages. From 5 to 7 cm. there are twenty-five males averaged in 2-mm. groups. From 7 to 15 cm. there are also twenty-five specimens which are averaged in 3-mm. groups. This portion of the data is less satisfactory because of the smaller number of specimens. From 15 to 20 cm. there were 487 males selected to exclude those lacking pincers or other legs. These are averaged in 3-mm. groups, and here again the numbers are great enough to give reliable averages. The entire material, therefore, includes 766 specimens taken in 1916 and 1917.

* Report of the Commissioner for 1915, page 162.

† *See* table, page 162, Report of the Commissioner for 1915.

Table 1.—Average Weights in Ounces of Male Crabs from 25 to 200 Mm.

Width.	No. of Specimens.	Weight.	Width.	No. of Specimens.	Weight.
Mm.		Oz.	Mm.		Oz.
26	1	0.2	74	3	2.0
29	1	0.2	80	1	2.5
32	1	0.4	101	1	4.7
33	3	0.23	107	1	8.0
34	3	0.27	116	1	5.0
35	1	0.3	119	1	7.0
36	2	0.25	122	2	8.25
37	5	0.34	134	1	10.5
38	6	0.33	137	1	12.0
39	13	0.32	140	2	16.0
40	9	0.37	143	1	15.0
41	9	0.38	146	3	15.0
42	12	0.39	149	6	16.7
43	7	0.41	152	16	17.9
44	6	0.5	155	28	18.75
45	6	0.5	158	32	19.7
46	7	0.49	161	34	20.3
47	2	0.55	164	23	21.7
48	4	0.575	167	48	23.15
49	4	0.55	170	32	23.4
50	1	0.6	173	41	25.3
52	4	0.675	176	40	27.1
54	3	0.73	179	39	27.8
56	6	0.88	182	46	29.3
58	3	0.97	185	28	31.0
60	3	1.07	188	39	32.3
62	3	1.2	191	16	34.1
64	1	1.1	194	20	35.8
66	1	1.6	197	4	36.2
68	1	1.8	199	1	40.0

The record here presented stops with 20 cm. and 2½ lb. This is about the maximum for Crescent; some are taken which exceed this in size, but I have not had an opportunity of measuring such. I have seen specimens at Prince Rupert which measured over 9 inches and weighed 3¾ lb.; dealers claim 4 lb. as a maximum.

Fig. 1, page 86, represents in the form of a graph the averages given in Table 1. Each dot represents such a value and is placed at the intersection of the lines corresponding to the width and weight. For instance, twenty-eight crabs 18.4, 18.5, or 18.6 cm. wide averaged 31 oz., and in the graph a dot will be found at the intersection of 18.5 cm. and 31 oz. The general trend of the values is shown by the heavy line. It will be noted that at either end where the material is ample this line passes through or very close to all the average values, and that the only part where deviations occur is where the number of specimens is small.

As has been pointed out by several workers,* the lengths and weights of a series of animals of different sizes follow the geometrical relations holding for any similarly shaped bodies, provided that in growth the proportions of the various dimensions—length, breadth, and thickness—do not vary; that is, if they remain strictly similar bodies. The geometrical relation is that while any of the linear dimensions, as the width, of two different-sized animals stand in direct proportion, their weights are in proportion to the cubes of their widths. For example, a crab 5 cm. wide is ⅓ the width of one measuring 15 cm., but it falls far short of ⅓ of the weight; it actually weighs 0.6 oz., while the larger crab weighs 16.75 oz., or 27.9 times as much. If the widths are cubed this relation is very closely represented: $5^3 = 125$, $15^3 = 3{,}375$, $3{,}375 \div 125 = 27$. The points representing the weights calculated from the assumption that they are proportional to the cubes of the width and starting with the observed weight of crabs 5 cm. wide are plotted

* For example, Fulton, T. W., The Rate of Growth of Fishes, Twenty-second Annual Report of the Fishery Board for Scotland, page 142, 1904.

on the graph as circles. It will be seen that they agree strikingly with the observed weights. This is in contrast with Fulton's figures where the calculated weight quite uniformly fell short of the observed weight in fishes.

As no data of this sort is available for the edible crab of the North Sea, the nearest relative of the species under discussion, I cannot say how they compare.

For those sizes between 16 and 19 cm. the approximate weight of the cooked crab is indicated by a dotted line below and parallel to that representing the live weight. The data on which this is based has already been given; the 4.27-per-cent. loss amounts to about an ounce, but for reasons already given this is probably too small.

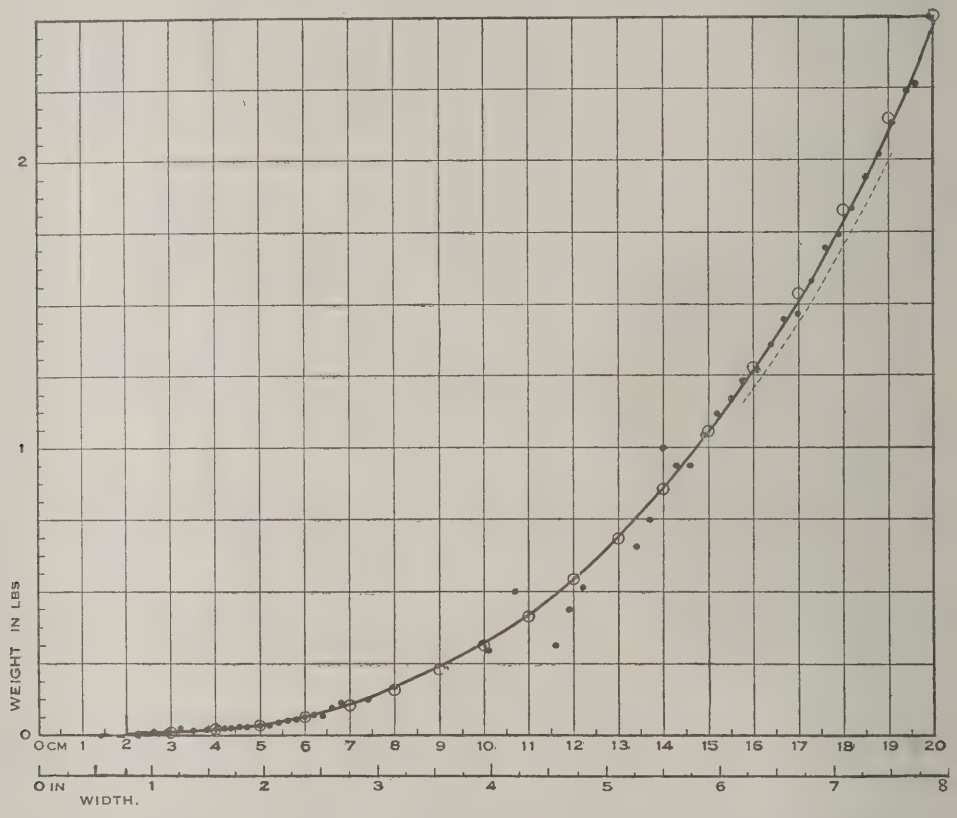


FIG. 1. GRAPH based on 766 specimens showing the weight in pounds and ounces of any male crab between 2.5 cm. and 20 cm. Solid line, live weight; dotted line, approximate cooked weight.

LARVÆ.

As stated in the report for 1915,* larvæ of the edible crab in the last or megalops stage were obtained at Sidney, Vancouver Island, July 22nd, 1914, and at Crescent July 5th, 1915. In 1916 they were first observed at Crescent on July 29th, and in 1917 on July 22nd. In the latter year there was an opportunity of following them through the season, and some were seen as late as August 30th, though they were most abundant about the end of July. This would indicate that hatching must extend over a correspondingly long period. Possibly some of the dates for previous years do not represent their first appearance, since they are too small to be conspicuous and are likely to pass unobserved unless a close watch is kept. Leaving aside possible slight inaccuracies in these dates, the great seasonal variation in the time of their appearance, amounting to nearly a month, is striking and of some importance in the life-history, as it would materially affect the time remaining for growth in the particular season.

* Page 161.

Seasonal Variation and Temperature.

Attention having been called to the seasonal variation, it was noted that the size of the crab in its second summer—the data on this and other questions of growth will be presented in a subsequent report—varied widely from year to year. The widths in three successive years as determined for the latter part of July are: 1915, 63 mm.; 1916, 58 mm.; 1917, 39 mm. It will be noticed that in 1915 the megalops appeared the earliest and the two-year-old crabs were the largest. To check the above observations they were compared with reliable data from an independent observer. Dr. Stafford has recorded in these reports* the dates at which oyster-spawning was first noted on several successive years: 1913, May 21st; 1914, May 7th; 1915, (April 23rd) (erroneously stated to be May 10th in the 1916 report; in previous report May 10th is given as date for larvæ, spawning was about two weeks earlier in other years); 1916, May 22nd; 1917, (May 20th to 25th) (Dr. Stafford's date not available for this year; locally said to be about same as previous year, possibly later). Here 1915 again appears as the most favourable year and 1917 as very backward.

To account for this agreement in seasonal variation in the crab and the oyster we must postulate a seasonal variation in the conditions surrounding both. Of these conditions the food-supply and the temperature will perhaps first suggest themselves. Since the food-supply is entirely different in the two forms, it is difficult to see how they would always agree in their fluctuations, and attention is strongly directed toward the temperature. This is supported from the physiological side by the known influence of temperature on all life processes, of which may be cited muscular activity, rapidity of digestion, and general metabolism. This influence must, of necessity, be more marked in forms like the ones under consideration where the animal takes its temperature from the surrounding water than in warm-blooded forms where the internal organs are maintained at a practically uniform temperature. Processes such as the ripening of eggs or growth require the building-up of extra tissue, and hence will not go on when, because of the reduction of temperature, metabolism is at its lowest ebb; metabolism must be active enough to give a surplus over and above the energy and repair of waste necessary to maintain life before growth can take place or masses of eggs be formed and thrown off.

In regard to growth, it is known from experiments that fish will grow more rapidly in an aquarium furnished with slightly warmed water than when supplied with water at the sea temperature.† In the case of the larvæ of some invertebrates it has been shown that growth not merely responds to temperature, but that it follows quite closely the laws governing the action of temperature on a simple chemical reaction, a rise of 10° C. increasing the rate of growth between two and three times.‡

Unfortunately few systematic records of water-temperature on this coast are available for comparison with the seasonal variations under consideration. In their absence air-temperature records must be used, and when it is borne in mind that on this coast the water is not merely influenced by the air-temperature, but in turn affects the air-temperatures near the coast because of the prevailing winds blowing from the ocean, it will be seen that they may fairly represent at least the comparative condition under which the marine animal lives from year to year. Seattle and Sitka have been chosen as representative of that part of the North Pacific Coast with which we are now concerned. The dates of spawning and of the appearance of larvæ would probably be influenced by the "earliness" of the season, and in the question of growth this would also be important, because it would determine the length of time available for growing. Two criteria have been chosen as measures of the earliness of the season. First, the mean temperatures of March and April have been selected as representative of the spring.

* Report of the Commissioner for 1915, page 157; for 1916, page 103.

† Fulton, T. W., The Rate of Growth of Fishes, Twenty-second Annual Report of the Fishery Board for Scotland, page 142, 1914.

‡ Peter, Karl, Archiv. f. Ent.-Mech. d. Organ. 23, page 130, 1906.

They are as follows:—

	1912.	1913.	1914.	1915.	1916.	1917.
Seattle, March	44.3	41.9	47.6	50.0	44.4	41.0
„ April	48.0	41.0	51.4	52.6	49.0	46.8
Sitka, March	39.6	37.8	39.6	44.6	33.8	33.4
„ April	41.8	40.1	44.6	44.1	43.4	41.9

It will be seen that 1913 and 1917 are cold and 1915 relatively warm. Secondly, the mean monthly temperatures for the entire year were plotted, and from this was determined the approximate date in the spring at which a certain temperature was reached. For this a temperature of 48° Fahr. (about 9° C.) was chosen, since we have good reason to believe that a critical temperature for the inception of growth lies between 40° and 50° Fahr.* The dates are as follows:—

	1912.	1913.	1914.	1915.	1916.	1917.
Seattle	April 15	April 12	March 21	March 5	April 9	April 23
Sitka	May 6	May 23	May 18	April 28	May 26	May 23

Again it will be noticed that this temperature was reached earliest in 1915 and late in both localities in 1913 and 1917, so that by either method we find in 1915 an early spring to account for the early appearance of the larval forms and in 1913 and 1917 late seasons to explain the late arrival of the young.

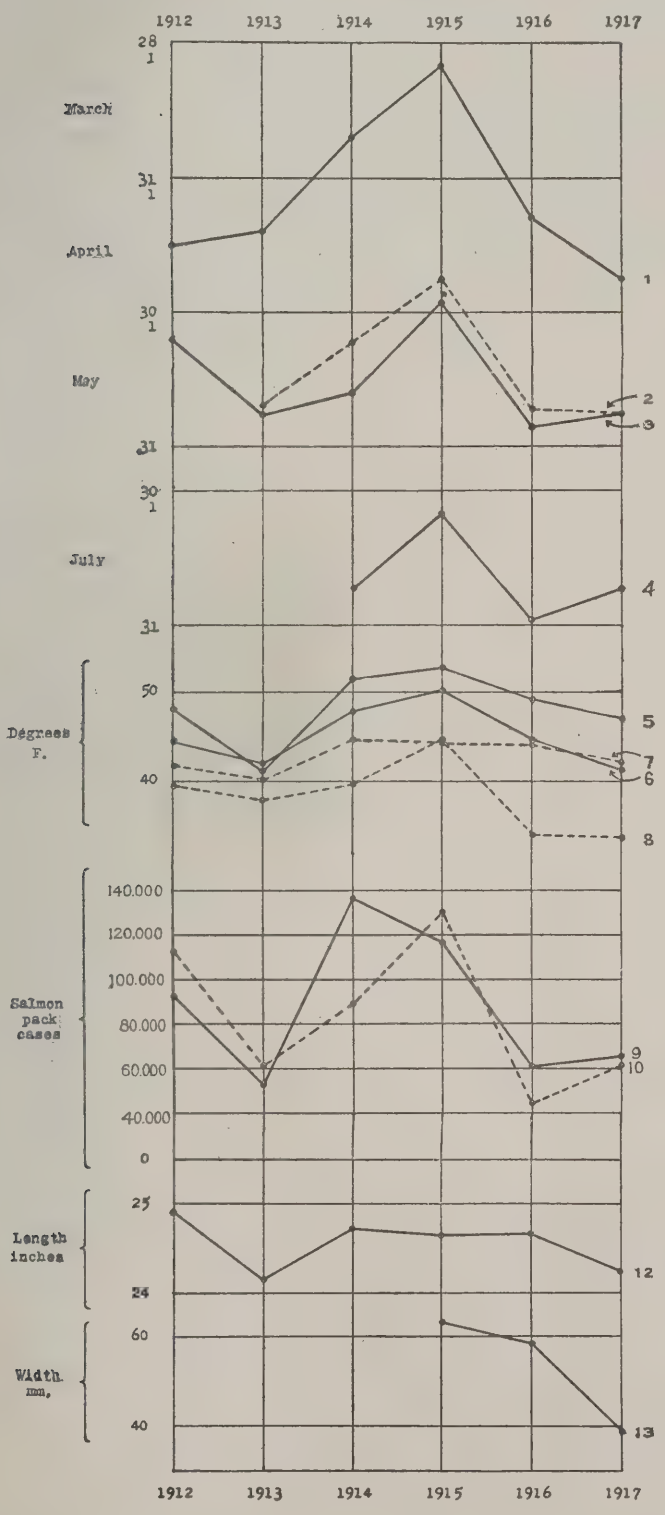
In discussing the facts just given relating to seasonal variation with Dr. C. H. Gilbert, he called my attention to a similar seasonal fluctuation in the size of the sockeye salmon. Through his courtesy I have had access to some of the data on this point which appears in his paper in the current report, and for this and much helpful advice and criticism I wish to acknowledge my sincere appreciation. In commenting on the small size of the Skeena packs in 1917 and 1913, he notes the small size of the fish, which may, he estimates, contribute as much as 10 to 15 per cent. of the shortage. Since growth was normal up to the preceding fall, when growth comes to a standstill, he concludes that the cause of the reduced size must have been operating in the springs of the years in question. He says: "Inquiry into the climatal conditions in the springs of 1913 and 1917 may throw light on the above hypothesis." In the present note the unfavourable climatal conditions at the time when growth should begin are shown for both 1913 and 1917, and his hypothesis receives striking support in the shape of proof of the presence of a factor tending to retard growth in the respective springs.

The average lengths of four- and five-year-old male and female sockeyes in the Skeena River runs in successive years as given in his paper were combined to give a single mean length for each year; these are as follows: 1912, 24.92 inches; 1913, 24.15 inches; 1914, 24.72 inches; 1915, 24.65 inches; 1916, 24.67 inches; 1917, 24.25 inches.

Not only is the size of the salmon available, but in the pack we have a measure also of the numbers of individuals present. The packs of the Nass, Skeena, and Rivers Inlet as given in these reports show that 1915 (and for the Skeena, 1914) was a favourable year and that 1913, 1916, and 1917 were poor. In Fig. 2, where all of the data just given is assembled in graphic form, this is shown by the lines 9, 10, and 11. A comparison of these with the temperature records (lines 1, 3, 5, 6, 7, and 8) shows a correspondence that cannot be ignored. The reason for this is not clear. The influence on the individual growth as shown by the size has an adequate explanation in the cold spring, but this can account for a fraction only of the difference in the packs. It is hard to see how the numbers could be influenced unless it were cold enough to cause the death of many fish, and for this we have no evidence.

* Compare Merriam, Life and Crop Zones of the United States, Bull. No. 10, U.S. Dept. of Agri., 1898, page 54. Here 43° Fahr. is taken as a critical temperature for land organisms.

Fig. 2. Graph comparing Seasonal Variations in the Crab, Oyster, and Salmon with the Temperature Conditions.



Explanation of the lines:—

1. Dates at which 48° Fahr. was reached at Seattle.
2. Dates of oyster spawning, Crescent.
3. Dates at which 48° Fahr. was reached at Sitka.
4. Dates of appearance of crab megalops, Crescent.
5. Mean temperature for April at Seattle.
7. Mean temperature for April at Sitka.
6. Mean temperature for March at Seattle.
8. Mean temperature for March at Sitka.
9. Sockeye-pack, Skeena River.
10. Sockeye-pack, Rivers Inlet.
12. Length of sockeyes, Skeena River.
13. Width of crabs in second year, Crescent.

Temperature is, of course, only one factor in a complex problem, and it would be the height of folly to expect that it alone would determine the run of any year. This is clearly shown in the case of the Fraser, where the effect of the big brood-year completely overshadows any influence of temperature or any other single factor. But if it can be clearly shown, as I feel the present cases show, that temperature is an important factor, the substitution for one unknown of a known and measurable influence places us that much nearer the solution of our problem.

We have here evidence from three widely different types of animals—the crab, the oyster, and the salmon—obtained by three independent observers, and in the case of the salmon covering many years and a great variety of localities, all agreeing with each other and with the temperature records in a manner that cannot be the result of chance. We can hardly escape the conclusion that temperature is an important factor in the life-history of marine animals, and as such deserves careful attention and study. I should like to add a plea for the collection of data on the water-temperature, which, though so clearly important for its bearing on the lives of valuable food-fishes, is almost wholly lacking for the entire coast. The only exceptions, as far as I know, are the Biological Stations at Departure Bay and at La Jolla, California.

THE NATIVE OYSTER OF BRITISH COLUMBIA.

(Ostrea lurida, Carpenter.)

By Joseph Stafford, M.A., Ph.D., Montreal.

Methods of Culture.

The oyster is one of our natural resources, and as such has been brought into existence by natural causes and perpetuated under natural conditions. It has likewise been limited by natural forces to circumscribed areas and restricted numbers, and its struggle for existence has settled down into a reciprocal give and take between itself and the other members of its limited world. Against these it is fitted by nature to defend itself, since the mortality brought about by adverse climatic, physical, chemical, or biological elements is offset by successful defence and fertility of reproduction.

When such a natural product is discovered and appeals to the wants of civilized man there is converged upon it a strain so sudden and vast as to surpass all innocent and unprepared defence. Man, by his calculating and inventive genius, both by wholesale mechanical seizure from the natural areas and by effective transport inland far beyond the original distribution, imposes a demand upon the natural product which is not only additional to the original demand, but is overwhelmingly greater in amount. The oyster-fishery, like every other fishery that has been exploited by man, is forced soon to respond by such decided falling-off in numbers as to rouse fears of depletion and final extinction. To permit it to readjust itself naturally would require restriction of the fishery almost to the point of prohibition, in which case, as a natural resource, it would cease to be of any economic value.

The only way to turn the natural supply of oysters to almost limitless value as a national asset is by artificial cultivation. That is what has been done in agriculture, forestry, and the like, where the natural production became too meagre for human requirements. We need not only to conserve the original stock, but to increase its productivity in order to keep pace with growing demands. This offers scope for man's intellectual and constructive activities in furnishing practical and productive methods of culture.

The importance of method in oyster-culture can hardly be overestimated. Everybody has had sufficient contact with some employment or mode of livelihood to recognize the advantages of methodical over methodless procedure. From the most commonplace elementary duty of the individual to the most complexly elaborated and correlated operations of great organizations there should be that relation between proposed action and desired result which is indicated by the terms "method" and "system." The managers of every business or profession draw on their accumulated stock of personal experience and acquired knowledge in forecasting a plan of action, and even assistants and employees are selected or rejected according to their ability or inability to work towards a required end. Since this is true for long-established and well-tested occupations of the masses, it must be acknowledged as all the more urgent in a pursuit (such as oyster-culture) where the accumulation of information is in the hands of relatively few people, the operations at times exposed to unusually great difficulties, and the results not immediately or distinctly exhibited.

Methods are estimated by results, and in consequence are spoken of as good or bad. But a complete method of oyster-culture is not a simple thing; it is composed of many separate acts of which each may be regarded as a method in itself and its advantages weighed. It may happen that the end-result depends especially upon the result of a single action. Such a critical analysis is not often thought out, but more commonly people rush ahead and sum up the whole as a sort of get-rich-quick business or as a failure. Much depends upon the application of the method. A good method in poor hands may be no more productive than a poor method in good hands. Yet a rigid following to the letter of a blind rule is not advocated for all places alike, but rather the intelligent adaptation of a good general method to the special conditions of the locality.

Methods of oyster-culture have originated in different countries and at different times. There is nothing remarkable about an independent origin in countries far distant and having no communication with each other. The accidental observation of oysters on anchors, ropes,

or hulls of ships, on buoys, piles, or lower timbers of wharves, or on other structures, is sufficient to suggest the putting-out of solid bodies for the purpose of catching spat and originating experiments that develop into a system. In olden times such a method was passed on from father to son from generation to generation, and in later times by historical transmission.

Italy has had a method of oyster-culture since about 100 B.C. According to Pliny, the artificial propagation of oysters was first carried out in the salt water of Lake Avernus by Sergius Orata, a Roman knight, who soon made a fortune thereby. On one occasion, becoming involved in a lawsuit for trespass, his counsel, Lucius Crassus, declared that if expelled from the lake his client would grow oysters on the roof of his house—no doubt a gross exaggeration for the time, but a remark that would cause little surprise at the present day.

England as a home for native oysters in great quantity and superior quality was frequently referred to by early Roman authors; it has been even hinted that it was the oyster that attracted Caesar to the coasts of Britain.

France, Holland, and Belgium have, since the middle of last century, developed the most painstaking methods of modern times, and some other countries of western Europe have likewise carried on culture of the common European species (*Ostrea edulis*).

Japan for some two hundred years has attained to considerable success with a different species (*O. cucullata*).

The United States began the cultivation of the common oyster of the Atlantic Coast of America (*O. virginiana*) independently of European countries and a few years before the modern methods were instituted in France. The oyster-fishery is now the most important fishery of the United States and greater than that of all other countries combined. Seed-oysters are shipped to the Pacific Coast and planted in suitable bays of California, Oregon, and Washington. The common oyster of the Pacific Coast of America (*O. lurida*) has also been cultivated in more recent time.

Canada possesses natural beds of the same two species as the United States, and of late years has made some progress in their cultivation. Intensive culture is all the more necessary here because of the more northerly position, the restricted areas, and the sparse seeding of the natural beds. The high attainment of the industry in the United States should spur Canada to great efforts in developing this fortunate natural possession. The coasts of Eastern New Brunswick, of Prince Edward Island, and of Eastern Nova Scotia have many warm shallow-water bays adapted to the requirements of the eastern species, so well known to the fresh-oyster trade, and seed from these regions as well as from Eastern States grows rapidly to marketable size in British Columbia waters. The eastern oyster is already cultivated at Crescent in Boundary Bay, at Ladysmith in Oyster Harbour, at Horseshoe Bay near by, and at Esquimalt. The western oyster is cultivated at Crescent and at Ladysmith.

In the early days people were content to gain a ready and comfortable livelihood, and culture was pursued on a small scale and generally in a half-hearted spirit. Progress was slow. A feeling of satisfaction with existing conditions, the self-assurance that accompanies little experience, and the assumption of special knowledge, set views, and unimproved machinery were some of the retarding causes.

With the progress of time, the growth of population, increased demand, the development of a commercial spirit, desire for wealth, competition, investment, formation of companies, etc., oyster-culture, like other means of production, came to be applied more earnestly. Calculation, adaptation, improvements, additions, inventions, were made and information sought from other districts and other countries. Along with a general advance in education, the improvement of implements, machinery, and transport did much to overcome prejudices. A deeper insight and a broader comprehension were gained, and men began to awaken to the possibilities of future developments and to cultivate a spirit of enterprise in great undertakings.

The fisherman, culturist, and capitalist have done much in the carrying-out of methods when once instituted, but the direction of the most important advances has always been indicated by the trained investigator. The routine work of mechanical operations can be applied by the masses, but the grasping of complex problems and the methods for their analysis can be handled only by men accustomed to research and that have the leisure to think. It requires the marshalling of all related sources of knowledge as well as the power of their application. Methods must conform to the mode of development, the structure and manner of life of the oyster, must take account of the physical conditions of the environment, must be applicable from local resources,

and must be kept abreast with the advance in knowledge and the improvement of machinery. New methods or new adaptations may be tested by inexpensive experiments on a small scale; experiments giving the best results can be applied on a large scale.

Selection of Locality.

Before going to expense in preparation for oyster-culture it is well to make sure of a few primary essentials with regard to locality, site, accessibility, market, transport, and the like. It must be understood, of course, that it is rarely possible to obtain everything that is desirable in a single location. But some things can be done without, even though inconvenient, while others cannot be dispensed with at all. A good deal depends upon the kind of culture it is proposed to carry on and whether such work is or has been conducted in the district before.

If there are or ever have been natural oyster-beds or scattered oysters in the region, one may feel sure that the physical requirements are at least somewhere near the mark. If there are no oysters but other bivalves that usually accompany oysters, the conditions may still be sufficiently suitable for some phases of culture. In any case it is best to examine with regard to the four primary essentials referred to in the section on environment (1915)—viz., sea-water (salinity), heat (temperature), bottom (substratum), and food (nourishment)—in order to decide whether or not oysters are likely to be able to live at the place under consideration. In this connection it must also be remembered that planted oysters can often live where reproduction would be impossible, and if the complete process or all the processes of culture are to be pursued it is necessary to be still more careful about the selection of a locality. The extent of the variation in salinity and in temperature, the amount of fluctuation in rise and fall of tides, the depth of water, currents, fresh water, flats, beaches, and exposure are some of the main things.

One of the first questions to arise is whether the business can be made remunerative. To judge this requires a consideration both of the probable productiveness and expense of working. The first must take into account the possibility of securing sufficient area to be worked and the chance of extension in order to keep pace with a growing trade. The second deals with such things as manner of working the beds, whether at low tide on exposed flats or at other times by means of tongs or dredge; accessibility of the beds; proximity of a continuous market; means of transport by train, railway, or boat; possibility of hiring help; sites for house, wharf, and other necessities convenient to both beds and shipping-station; means of living and provisioning and of procuring utensils and construction materials. The best locations are those possessing more than one kind of regular communication with large cities, so that competition will keep down rates and orders may be filled often and promptly and without delay in transit. On the other hand, on account of the manner in which the oyster procures its food, oyster-beds should be kept out of the way of drainage and sewage from large centres of population and from wastes from manufactories, mills, and the like.

Government Permission.

It needs scarcely to be mentioned that the sanction of Government is required to right of usage of a bay or portion of a bay or other body of navigable water for special purposes. Such right refers only to the purpose for which granted and should not interfere with the rights of others in legitimate navigation, fishing, etc.; neither should others interfere with the rights of the culturist or damage or remove any of his property. It must be understood that property on or under sea-water or exposed at low tides can be personal and private in the same sense as property on land, and as such is subject to protection according to law.

Apparatus and Construction-work.

Even the simplest kind of culture on a small scale requires some apparatus and construction-work. It is surprising how little suffices at some places. It may be well to not procure or construct much at the start until it is found by practical carrying-out of the processes what will be most convenient and efficient for the locality. A strong, somewhat shallow motor-boat with some deck-space, a float, a wharf or landing, a house, are most likely to be needed. Instead of several large scows some companies make use of a larger number of much smaller "batteaux" that can be left anchored on different beds ready for loading, and because of their narrowness and pointed fore end are not so likely to drag anchor in a storm or be swamped and may be

towed with greater speed. Depending on the manner of working the beds, additional boats, scows, floats, buildings, and dredges, tongs, rakes, forks, hand-barrows, wire shovels and pails, sorting-knives, etc., will be required, and sacks or boxes for shipping.

Operations of Culture.

The operations bearing most directly upon the cultivation of oysters may be primarily separated into two groups—the first dealing with the simple process of planting and growing-up of seed oysters obtained from dealers who make a business of supplying seed, the second dealing with the more difficult special processes of raising one's own seed. The culturist who wants to reap the greatest benefit from his knowledge and labour should do both.

Raising Oysters from Purchased Seed.

In order to keep this set of operations more distinctly separate from others, we may select the planting and growing in British Columbia of seed-oysters obtained from Prince Edward Island or Connecticut or other Province or State in the East. This is what culturists generally set out to do, because the work is more easily and surely performed and results are sooner visible in the production of grown oysters ready for market.

Buying Seed-oysters.—Seed, as referred to in oyster-culture, does not have the same meaning as in grain-culture. Seed-oysters are not a definite stage in the life of oysters as grains of wheat are in the life of wheat-plants. Such oysters may be any stage between the youngest spat and the grown oyster. They correspond, therefore, more closely with young fruit-trees obtained from a nursery and are not all of the same age, size, or appearance. They are already oysters (not eggs or seeds) and only deserve the name of seed in the sense that they are the starting-point of cultivation by many culturists.

The value of seed depends primarily upon the number of living oysters it contains as compared with useless matter like dead shells, stones, sponges, etc. It may even carry over enemies, parasites, or other undesirable animals. If it is in the rough state as scraped from the beds where it was produced it will contain a greater proportion of rubbish than if it has been more or less culled. The larger the oysters the more valuable they are counted, because the more capable of withstanding change of conditions and attacks of enemies and the sooner they grow into marketable sizes. On the other hand, the smaller they are the greater the number in a bushel and the greater the gain if they succeed in growing to maturity. Another consideration is the locality from which obtained and the climate to which accustomed.

The price may vary from about 10 cents to more than $1 a bushel. What is called "spat" by the oystermen, young seed set in the summer of one year and offered for sale (as seed) in the spring of the following year, requires 8,000 to 10,000 to fill a sack of three bushels. "Two-year-olds," belonging to the same set but sold a year later, go about 5,000 to a sack.

Transport.—This may be by boat or by train or part of the way by each, and transfer may be required by wagons. Handling should be reduced to the minimum and performed with care. The seed should not be kept out of the water longer than necessary. It should be shipped while the weather is cool. It should not be left exposed on a wharf or side-tracked in a car. It should be kept cool and moist with ice, but not frozen, and there should be no sudden or extreme change. If possible, the car should be ventilated, the inflowing air passing over ice, and the sacks, made of loose, open material, packed so as to allow the air to pass among them.

From Bridgeport, Conn., to Crescent, B.C., a car-load, all the way by rail, consisted of:—

175 sacks at $3.50 a sack	$ 612 50
Freight, 31,800 lb.	571 50
Ice	12 00
Total	$1,196 00

It will be seen that for such a distance the transport costs about as much as the seed itself—another reason why it is of advantage to buy clean seed. The time required was seventeen days and the oysters were received in very good condition—only a few having dried badly by having the thin edge of the shell broken through contact, weight, or rough handling, so that they were unable to retain their juices.

Having been informed beforehand of the time of arrival, everything was ready to get the seed into the sea-water without delay.

Planting.—The sacks were slid down a trough-like incline of planks reaching from the car to a scow, on to which the seed was emptied and the loose sacks were dipped into the sea-water and spread over the oysters to protect them from the sun. The scow was then towed by motor-boat at high water to the planting-ground, already staked out at low tide, and the seed scattered by men with shovels (Fig. 1) as the scow was slowly moved back and forth over the bed.

The ground selected is on what has been called the "eastern bed" in the last report, situated south and east of the channel of the Serpentine River where it makes a semicircular curve to pass between eastern and western beds on its way to join with the channel of the Nicomekl River. The area that can be used is upwards of half a mile broad and covered with 8 or 10 feet of water at high spring tide, but exposed for about five hours at the corresponding low tide. The space required for a car-load of seed is a surprisingly small patch, so that there is room for a good deal of selection even within the limits of the eastern bed. There are parts higher and first exposed, somewhat sandy and without eel-grass, and parts that are lower or on which the water lies longer, inclined to be muddy and to some extent covered with eel-grass. The car-load referred to was put down on such a place as the last, where one sinks a little in walking, but it is firm underneath and can hardly be said to ever dry off.

The specific gravity of the water above this bed rarely falls below 1.016 and is generally between this and 1.020. The fresh water of the Serpentine spreads out over the bed at high and falling tide, but when the flats begin to be exposed it comes to be confined to the channel. At rising tide, when the water of the channel begins to overflow, mixed fresh and sea water is brought back over the bed. The fresh water of the Nicomekl is carried off without affecting the bed at falling tide, but some of it may be brought back at rising tide. Ordinarily the water from both rivers is not sufficient to lower the salinity to a greater degree than that mentioned. At times fresh water from the Fraser River is turned by tide and wind into the bay and lowers the S.G. to 1.012, 1.010, and even 1.008. This happened in July of 1913 and 1916, but not in 1914 and 1915.

The temperature of the high-tide water above the bed seldom reaches 15° C. before the first, second, or third week of May. Shallow layers left in hollows on the flats for several hours during low water, river-water coming down a warm valley or channel-water draining off flats, and the shallow edges of tidal water on beaches may attain to this temperature a week or two earlier. A degree of 20° C. in the high-tide water over the bed is touched very rarely—about once in a summer, although 19° C. is attained several times. The great mass of the tidal water is held at 16 to 18° C., but thin layers left stranded and exposed to the sun for hours during falling and rising tide may reach 25°, even 29° C. for an interval.

Separating.—After the seed has grown for a year it will be found to be largely composed of bunches of about half a dozen oysters with the hinge ends grown together and stuck in the mud, while the opening ends of the shells point upwards and diverge from one another. It is quite plain that the oysters in a bunch were originally held together by the same piece of cultch, although they may have grown to each other more securely since, and that the upward divergent extension was due especially to an effort on the part of the growing oysters to separate as much as possible and get to free water and food. If left in this state they will continue to grow long and narrow or some of them will die. It is part of the work of the culturist to break these bunches apart into their separate oysters and to distribute the oysters over the beds thinly (Fig. 2), so that each has room to grow in breadth and thickness as well as in length without interfering in feeding, respiration, and excretion. Where the oysters are too thickly planted some of them should be carried to spots where there are few or none. This can be done during the long low-water periods of spring tides.

Growing.—The seed grows to good-sized oysters in two or three years from the time of planting, depending upon the size started with and the rate of growth—the latter again being largely due to locality (temperature, salinity, food, etc.), but also to individuality and attention. They do not all grow at the same rate—even oysters lying side by side in equal conditions differ in size and shape. They have their differences of constitution and appetite as well as in other respects. Some weaken or die from hereditary causes, some happen accidents, while others are partly starved or smothered. The death-rate is usually low for the first year, but increases rapidly with the second and third years. There is an advantage in using them as fast as they grow to sufficient size.

Harvesting.—In gathering the oysters for market, if there is much variation in size the larger may be picked by hand, leaving the rest for further growth. They are carried in wire pails and loaded on to a near-by scow. If the greater number are marketable a speedier way is to rake all the oysters (Fig. 3) into little heaps, then rake the heaps on to hand-barrows, each of which is carried by two men and emptied on to the scow. As oysters are not cultivated in deep water in this country, there is no need of using tongs or dredges, except perhaps rarely as a means of procuring oysters at high tide when the collected stock has run out.

Sorting.—This can be performed as the oysters are picked, or may be done on the scow during the period of high water, when the undersized and small oysters may be thrown back on to the bed at once. But it is generally more satisfactory to tow the loaded scow (Fig. 4) to the wharf, where sorting and trimming can be carried on irrespective of tide and weather. The large oysters have the undersized and small ones pried off by a strong oyster-knife, the barnacles chopped off by a heavy butcher or carving knife, or they may be otherwise cleaned and washed. They are then shovelled into a large float beside the wharf or scow, where the tide-water can flow over them and keep them fresh for market. The undersized and small oysters are taken back and replanted either together or, better, in assorted sizes on some portion of the bed for further growth.

Shipping.—The oysters may be shipped to markets in sacks or in boxes. The latter are preferable; they are more easily handled, the oysters do not jam so badly and get their edges broken, and they look tastier. The boxes are made of thin, dry lumber (not too closely nailed together) of a size to hold 25 dozen packed oysters. The name of the company or the trade-name of the oyster may be printed on the ends of the boxes and the address to which consigned may be conveniently written by coarse blue pencil on the top or side. The best shipping arrangements should be made to protect from the sun and to hasten delivery—whether by wagon, auto-truck, railway-car, motor-boat, or steamboat.

Marketing.—Orders come from fish and meat markets, fish and meat retail stores, restaurants, and hotels. When once introduced the business is likely to hold from year to year and even advertise itself and grow. At first some advertising, canvassing, correspondence, or sending of samples may be necessary.

Raising Oysters from Collected Seed.

Another way of starting with seed-oysters is to collect seed from natural oyster-beds and transfer it to one's own beds. To the culturist in British Columbia the great natural oyster-beds or reefs of the Atlantic Coast are too far distant to be practicable, and the only thing for him to do is to buy from a seed-collector there, as has been already considered.

With regard to the native oyster in British Columbia, there are no great natural beds and any small and thinly seeded beds that do exist would soon be exhausted if there were any drain made on them. Moreover, it would take a great deal of work for the small amount of seed that could be collected. Their value lies in being there, little as they are, as an indication of suitable environment and a starter for cultural operations.

To transplant the native oyster to other parts of a bay or to other bays for further growth it is necessary to pick or rake them and transfer by boat or otherwise in a similar way to what has been described for the eastern oyster, except that for small quantities and short distances some of the precautions are not necessary. There is no business in the supply of seed-oysters on the Pacific Coast and it is not possible to buy them in car-loads. The culturist has to gather them himself or hire it done, a few sacks at a time.

Raising One's Own Seed.

In procuring his own seed there are open to the culturist the same methods as are made use of by the seed-producer who provides seed for sale—viz., the collecting of natural seed from favourable natural beds and the raising of seed by cultural methods. Since, as has just been stated, the natural beds of the Atlantic oyster are too far away to be practicable and the natural stock of the native oyster is too limited to furnish a continual supply, the only alternative is to buy seed of the former and to raise seed of the latter. In order to keep the operations separate we may now select the method of raising seed of the native British Columbian oyster in home waters.

1. In an Oyster-bay.—If the culturist is operating in a bay more or less naturally seeded with native oysters the beginning is already made for him. The oysters there have been perpetuated in successive generations for unknown time, and an examination will show that the existing individuals can be classified into several generations. From the largest and oldest adults it is an easy matter to select sizes descending to those smaller and younger ones which the oystermen might call "seed," and continue to the still smaller and younger stages which they would call "spat." If close inspection is made there may be found specimens so small as to be almost invisible to the unaided eye—the spat of the zoologist.

Spat on Natural Marine Objects.—It is not only possible to find spat on adult and seed oysters, but to find them on other shells, such as clams, cockles, mussels, whelks, even on gravel, stones, rocks, and other natural bodies.

Natural Cultch.—Since all such hard bodies offer anchoring-points that are seized upon by larvæ to save themselves from sinking into the mud or from drifting away by currents, they long ago came to be known to fishermen as "cultch" (clutch). Empty shells of dead animals are just as good or even better for the purpose than the shells of living molluscs; in fact, the greater part of naturally occurring cultch is composed of the empty shells of oysters that have lived on the surface and of clams that have burrowed into the bottom but whose shells have come to be washed bare after death.

Artificially Supplied Cultch.—Of the spat that becomes fixed to natural cultch comparatively few grow up to maturity, so that the natural accumulation of cultch is slow. The deficiency may be made good by the culturist who can gather oyster, clam, or other shells wherever they are to be procured and scatter them on his bed among the living oysters. The spat collected by either the naturally occurring or the artificially supplied cultch can be used as seed for transplantation.

2. In an Oysterless Bay.—If there are no native oysters in the bay and the culturist has good reason to believe that they could live and propagate there, he has to begin by procuring native oysters from some other bay (preferably of the same region) and planting them out on his own beds. Any stage of spat or seed or grown oyster will do, but the younger they are the longer it will take them to grow to maturity and become breeding oysters. The present object is not to grow planted seed to oysters for the market, but to grow it to breeding oysters with a view to developing a stock. For this purpose the full-grown oysters are best, since they will be ready to spawn in the first season and will produce the greatest amount of spawn. Such oysters are what practical oystermen call "spawners." They are also seed-oysters in the sense that they are the starting elements of production in a fresh area. If there are young oysters and spat mixed with them it will not be objectionable, since these will grow up to increase the spawn as well as to increase the cultch. This last is a very important point. Next after having oysters in a bay the culturist must see to it that there is cultch.

Where there is no cultch there can be no naturally occurring or artificially propagated oysters because there can be no naturally deposited spat from which oysters can grow up. In every bay or in some part of every bay there is almost sure to be something in the form of cultch even if it is only an isolated stone or clam-shell. But it takes a long time for nature to build up an oyster-bed from such a start. This is one reason why our oyster-bays are so thinly seeded with oysters. Another reason is that so few eggs are successful in developing to the spatting stage. Before spat can be deposited there must be these two conditions present at the same time and place—viz., the presence of the young of the oyster at the spatting stage and the presence of cultch on which to set. The greater the number of the young the greater is the chance for each piece of cultch to receive one or more spat; the greater the number of pieces of cultch the greater is the chance for each of the young to find one of them. These two conditions operate together—each a correlative and a necessity for the other. A stone or a clam-shell may catch a spat which may grow and sooner or later become adult and give origin to numerous young. Several of these may be deposited on the original piece of cultch or on the parent shell, and by their number as well as by their growth increase the surface of the cultch, or by breaking apart increase the number of pieces of cultch. In such a way a bed may be originated and extended. Under the best conditions it is a slow process, for each generation requires time to develop to maturity before it can take part in the process of reproduction. Moreover, the increase is not so fast nor so sure as the mathematical calculation might lead to suppose, for the spat and oysters are subject to many and powerful agents of destruction which keep reducing their numbers.

It is in the power of the culturist to do much to increase both the number of the young and the amount of the cultch and in so doing to assist and hasten natural processes. Of the two, he can do by far the most in the supply of cultch. In a natural oyster-bay the scarcity of oysters is evidently not so much due to want of young as to lack of cultch. The very presence of oysters shows that there has been a succession of generations each of which must have produced great numbers of young. The natural capacity for increase of young is greater than for increase of cultch. The natural increase of young is annual, that of cultch requires several years to become effective and may be destroyed in the meantime. New cultch overlies old, often without increasing its surface, and old cultch in the form of shells is continually wasting away.

Whether a bay contains a few thinly dispersed, naturally occurring oysters, or whether it has had a few oysters native to the coast artificially deposited in it, the operations of the culturist are the same. Increase in the number of oysters can only be brought about by increase in the number of spat, and spat must have cultch. The cultch formed by the shells of the living oysters is not enough. The cultch added by the natural accumulation of shells of clams, cockles, mussels, etc., is too slow. The culturist is losing time by waiting. This is one reason why it is advisable to begin growing transplanted eastern oysters. Their shells are an important contribution to the stock of cultch. Besides, they soon grow to marketable size and help to pay expenses as well as make a start in procuring a market.

An oyster-bay and an oysterless bay may be considered as extremes between which there may fall bays that according to size and structure would need to be managed in one way or the other. Extensions from the sides of oyster-beds, provided they are furnished with cultch, will become automatically seeded with oysters. Similarly, an artificially prepared new bed within reasonable distance from a prosperous old bed will also become seeded, provided tidal currents flow from the seeded to the unseeded bed. A bay may be so large and the tidal movements so modified by islands or reefs that one part of it is as effectively separated from another as if it were in reality in a separate bay. In such a case a new bed will have to be planted not only with cultch, but also with living oysters (spawners).

EGGS, EMBRYOS, AND LARVÆ NOT PRACTICABLE AS SEED.

In the foregoing pages has been considered the method of raising spat for seed. This is the method, it might be said the historic method, of the culturists. Long before the complete life-history of the oyster came to be known, long before even isolated stages of the developing oyster were known, it was already known that young oysters could at times be obtained by putting out solid objects for their reception. The youngest stages of these young oysters were not seen and the culturists knew nothing about them. It was only after the cultch had been in the water some time that the spat could be seen and their further growth followed into recognizable oysters. Since all the stages in the life-history of the oyster have come to be known, the question arises, "Why not begin with a younger stage than the spat—why not, in fact, begin with the egg as is done in breeding poultry, fishes, and lobsters?"

This is not practicable. As has been seen from the experiments of last year's report, it is not a difficult matter to procure eggs of the eastern oyster and sperm for their fertilization and to develop the young from the egg through the embryo to the larva. But it becomes very difficult or impossible to develop it to late larval stages such as immediately precede the youngest spat. In fact, I do not believe it has ever been accomplished. There are statements in the literature, it is true, that would indicate it had been done, but it is not hard to show that they were mistakes dating from a time when the full development was not known.

For the western oyster it is not difficult to get eggs, embryos, or young larvæ from the mother-oyster and they may be kept for several days, but the same difficulty arises as with the eastern oyster. The later stages of the larvæ of either oyster, right up to the spatting stage, can be readily captured in the sea-water about its natural beds by means of a plankton-net, and may be kept in beakers of sea-water for several days, but they will die rather than become fixed and metamorphosed into spat. Artificial methods have not yet been able to imitate in a small way, not to say improve on, natural methods at this period. The reason is not hard to find; it is due to the difficulty of keeping larvæ confined in small vessels of water so as not to be lost and at the same time supplying them with suitable food, keep the water aerated, and effect the removal of their excreta without introducing undesirable animals and plants that may multiply in overwhelming numbers to the disadvantage or destruction of the oyster larvæ. It is not hard

to believe that it will yet be possible to overcome these difficulties and to cultivate food in suitable kind, quantity, and purity, either in the same vessels with the oyster larvæ or in separate vessels from which the larvæ may be fed. A clear perception of the requirements is an important step towards the achievement. It would seem, however, that there is little to be gained in extracting larvæ from the water to be kept and attended for a brief period and then returned to the sea. All the eggs, embryos, or larvæ that culturists could collect from oysters or from the sea, even if they could be kept alive for a time and again turned out into the water, would be an almost negligible number compared with what are naturally poured into the sea without the help of man.

Seed of Eastern Oyster not originated in the West.

While the eastern oyster in all sizes from the youngest "seed" ("spat") up is capable of living, growing, and spawning in western waters, and while fertilization, segmentation, and development may proceed for an interval, there is no seed produced and the stock of the eastern oyster cannot be replenished by breeding on the planted beds, but has to be kept up by repeated shipments of seed from the East.

Work on Oysters.

The work of the culturist has to deal first with the oyster and second with the environment. The work on the oyster is not confined to the adult, but includes the developing stages as well. This is where all former work in culture has failed to produce the best results. Men worked with only the marketable oyster in their minds and did not consider how the marketable oyster comes to be such. They did not stop to think whether more can be accomplished by providing for the eggs and young stages than for the adults. The best method must take account of all stages of development and begin to provide for the egg and the larva as well as for the spat and the adult. To do this we need to know these stages of the developing oyster and to know where and when they are likely to occur and what conditions of environment they require. It was for this purpose that I made the special investigations and wrote the four preceding reports on Embryology, Anatomy and Physiology, Environment, and Cultural Experiments.

Egg.—The egg, as the first stage, is especially to be guarded. It is bad policy to permit wholesale loss of eggs and afterwards become oversolicitous for the few survivors that have passed into succeeding stages. Medium- or average-sized western oysters spawn about 1,000,000 eggs at one time. Where there are many spawning oysters on a bed there must be countless numbers of eggs spawned. Yet in a state of nature there is little, if any, increase in the number of oysters to be seen from year to year. The number of eggs that develop successfully into adults agrees pretty well with the number of deaths of adults. There is a tremendous loss from what may be called the accidents of life. Nature seeks compensation through numbers. Artificial propagation should profit from the lesson and seek to increase the number of eggs spawned. To this end it will not do to keep selling off all the adult and well-grown oysters. A good proportion should be held for breeding purposes. The number of eggs produced increases rapidly with the increasing size of the oyster. The largest and oldest oysters are by far the best egg-producers.

At this point it may be mentioned that there is a notable difference in the number of eggs spawned by our two species of oysters and in the manner of treating their eggs. Whereas the eggs of the western species are to be counted by hundreds of thousands, those of the eastern oyster are to be enumerated in millions. But the western oyster makes up for what it lacks in numbers by a greater parental care. While the 16,000,000 or more minute eggs of our large Atlantic oyster ooze out or are squirted out of the parent into the sea-water and sink to the bottom about or in the neighbourhood of the spawners, the 1,000,000 or so of the comparatively large eggs of our small Pacific oyster are retained for upwards of two weeks in the mantle of the parent, where they escape many of the exigencies of life to which the corresponding stages of the eastern oyster are subjected. The reproductive elements of the Atlantic oyster, when discharged from the parent, are minute helpless eggs, entirely at the mercy of their environment; but from the Pacific mother-oyster issue larvæ provided with locomotory swimming organs, protective shells, sense-organs, etc. In the former there is all the more need for the spawners to be left or placed in suitable locations as regards substratum. If the eggs settle on to soft mud or shifting sand, at least a large proportion of them is likely to be lost. Hard bottom of rock, gravel, or clay is best for this purpose. Another requirement is the absence of strong currents

that would wash the eggs away from the good bottom. Both of these conditions are also conducive to successful fertilization where, as in the Atlantic species, the eggs may be extruded from the parent before being fertilized. In the Pacific oyster the eggs are fertilized after leaving the oviduct but while lying in the suprabranchial, intralamellar, and infrabranchial cavities by means of sperms from other oysters brought by the respiratory currents. In the Atlantic species, while some eggs no doubt meet with sperm in the same way, it is likely that, on account of the rapid passage to the outside, most of them first come in contact with sperm after complete extrusion. To facilitate this chance not only is the character of the substratum of consequence, but the presence of somewhat quiet water and the number and proximity of male spawners. If the breeding oysters are thinly scattered there may be an advantage in collecting them more in clusters to assist in fertilization. Muddy water should be avoided, for eggs may be crushed or smothered by even a thin layer of deposit.

A cause of more rapid destruction of eggs exists in exposure. Where they lie below low-tide mark in a continuous mass of water they are tolerably safe. But where they are supported on grounds that are left bare by the falling tide they may be exposed to a scorching sun or a shower of rain or a cold atmosphere. As the great masses of oysters occur naturally or are cultivated on grounds just above or below the low-tide line, steps should be taken to guard against overexposure. The spawners should be placed in the best positions from the standpoint of the egg. Below low-water line, in the more quiet places of channels and sloughs, in the sheets of water retained in the hollows of flats, where the water is held back by eel-grass, in coves and lagoons may be mentioned. Even parts of exposed flats may be made safe for this purpose by being inclosed in shallow dykes that retain a few inches of water during the period of low tide. Of course, such places must be selected as are not overflown with river-water, following the receding salt water.

Larvæ.—Since successful eggs develop into larvæ it may be judged that areas selected for eggs must also have reference to the needs of larvæ. In general this will be the case, but it must also be remembered that eggs are quiescent while larvæ are active swimmers. Although they do not swim great distances, they serve to keep suspended for periods in water that by tidal or other currents may be carried and distributed far from the grounds on which the spawners and eggs were deposited. From the standpoint of the culturist this is the great drawback of the larval stage. He may have succeeded in obtaining and guarding a large deposit of eggs only to have the succeeding larvæ carried off and scattered over other more unsuitable grounds or lost in deep water. Every falling tide carries suspended larvæ seaward to be deposited and settled in all kinds of places. Every rising tide carries larvæ to higher levels of flats and beaches to be exposed at the next low tide or to suffer from the effects of fresh water. The ceaseless effects of tides keeps reducing the number of larvæ in the region of the original spawners. There is no practical way of herding the original stock. They are too small to be confined by anything of the nature of wire netting. Materials such as used for plankton-nets are too perishable. Netting of even large mesh offers such resistance to flowing water as to be immediately rent. Floating timber and seaweeds clog and increase the pressure. The only thing to be done appears to be to prepare for a heavy loss of larvæ by preserving vast numbers of eggs. The more eggs there are preserved the more larvæ there will be lost, but also the more there will be saved. The whole stock of larvæ does not rise in swimming movement at one time. Some are lying on the bottom, some are swimming at different levels between the bottom and top, some are rising and some falling at every moment. This much may be observed from the experiments with larvæ in glass beakers and from the plankton collections taken at high and low water and at rising and falling tides. I have sometimes thought that the larvæ can distinguish falling from rising tide and that they govern themselves accordingly. Larvæ taken from a western oyster fresh from the flats and placed in a beaker of fresh sea-water seem to rise in greater numbers at the time of rising tide and to settle in greater numbers at the time of falling tide for several days after being removed from the sea to the beaker. Plankton during rising and falling tides often appear to verify this thought, but the collections must be taken where sediment does not interfere. There is no question but the larvæ have it in their power to drop to the bottom to avoid being drifted out by falling tide and to arise when they feel the fresh, cool water of the rising tide, but whether they have sufficient intelligence or instinct to do so it is difficult to decide. Of this much, however, we can be sure, that the larvæ are most plentiful near the centres of their origin and become fewer and more scattered in proportion to the distance from these centres.

This gives us a clue as to where to plant spawners in order to obtain a stock of larvæ—even though somewhat of a floating population. They may be put in lagoons and coves where there is a greater distance to be drifted out to sea or more obstructions to distribution by the tides, in sloughs and pools where there is sufficient water at low tide to keep them from drying out, on low parts of flats where they will be protected by water held back by matted eel-grass, or at low-tide mark where at least some of them will survive the free larval period. Where there is no natural area or where this is too small it may be possible to construct an artificial one, such as a pond or a dyked-in area. As a preparation for the close of the larval period there must be an abundance of cultch either naturally occurring or artificially supplied.

Spat.—As soon as the larvæ are grown to full size and have become fixed to cultch there is no more chance of drifting to destruction, and the care of the culturist is for the most part turned in new directions and along surer lines. The full-grown larvæ have either been saved by successful fixation or they have gone lost. It is the attached spat we have now to deal with. The expert is soon able to form a pretty safe judgment as to the value of the "catch," but the rank and file will need to wait a few weeks before the result is plainly exposed. During this time the minute spat are growing larger and becoming more visible, and the observant oysterman can form conclusions as to the number and closeness of the "set" on his cultch and whether to leave it undisturbed or to remove it to safer places.

The disadvantages to which the spat are most liable are sediment, drying, frost, and crowding. It must be remembered that spat are unable to creep out of any deposit of sand, mud, or weeds, and from their small size and tender structure are easily covered and crushed or smothered. There is sure to be warm weather succeeding the set and before winter, and those uncovered by the tide are at first just as liable to be dried up and killed by the hot sun or dried out by a warm atmosphere as are the larvæ. A little later in place of heat there is the question of frost. Frost and ice are destructive—the first from the formation of crystals in the soft parts of the spat, rending the tissues, the latter from weight or grinding movements. Cultch with its set of spat that is already in safe places needs no immediate attention, but that in less favourable places should be looked after at the first opportunity. At this period the culturist can employ his time to more advantage in rescuing unfortunately placed spat than in any other way. He cannot have another like opportunity for a year—and a year's growth of the thousands of spat he may save is an important item, not to mention the addition to his future breeding stock. After overcoming all the risks to this point it is too bad to allow spat to be destroyed in masses for want of attention at this time. Unfavourably disposed cultch that is sufficiently well dotted with spat should be transferred to better places below low-tide level, in sloughs, in dykes, etc. During the cold part of the autumn, winter, and spring the spat do not grow much, but they thicken their shells and become better protected against accidents. By the time the warm weather of the succeeding spring and summer sets in many of them may be crowding one another for space and food, but they are still too small to separate from the cultch and the latter is still too hard and strong to permit of breaking in pieces in order to relieve the pressure of growth of the spat. The crowding individuals will begin to curve and diverge from one another and to bend away from the cultch, so that with the rapid growth of the summer there will be left only a comparatively small surface of attachment to the original cultch. The culturist can decide when it will be best and when he can best spare the time to break apart the growing bunches and spread them over more ground. He can also judge by the growth whether they are in good locations as regards food-supply or if they had better be removed to richer feeding-grounds. Generally speaking, the localities having a blackish mud bottom and in or near beds of eel-grass can supply a greater amount of food than those on harder and lighter-coloured grounds. The black mud is itself especially due to plant and animal decay and is an indication of the abundance of organic matter that can either serve for food or can support food-supplying organisms. Spat that have already grown somewhat can hardly sink into the mud by their own weight, and, besides, their rapid growth will help to keep their edges above the surface.

Adult.—Since the spat passes insensibly into the adult without any change of habits, much of the preceding treatment is applicable to the adult also. There comes a time when it is necessary to break apart the bunches of oysters that have grown up from the more or less thickly clustered spat on single pieces of cultch. If left as they are the oysters of a bunch have to grow up side by side and will become long and slim and perhaps somewhat warped for

lack of space. The food that comes their way has to be divided up among the individuals of a bunch and the chances are against every oyster getting its full share, with the result that growth is unequal and some may be starved. The larger and faster-growing individuals may even grow over the smaller ones in such a way as to hold their valves closed so they cannot feed. When a bunch is lying in sand or mud some of the under oysters may be buried and suffocated. There will be much variation in size, shape, appearance, and condition of the oysters, so they will present an uneven sample. As soon as the culturist finds this state of things arising he should go over the bed and break the bunches apart, distributing the oysters so as to allow each proper space and a fair chance for food. At the same time he should thin out the more thickly clustered spots and transplant part to thinly planted patches, to the edges of the bed, or to other areas.

In transplanting at this stage the oysters are of a sufficient size to lie on some mud bottoms without being lost. When lying flat an oyster will rarely sink. As is well known, mud bottoms occasion rapid growth. Even a moderate amount of decaying weeds will either furnish food direct or will supply microscopic organisms, such as bacteria, that may either serve as food for the oyster or its developing young or for still other organisms that in their turn come to the oyster. Where weeds are so plentiful as to form matted, rotting masses over the oysters the latter will be killed; but where living weeds straighten up in the rising tide and permit fresh sea-water to come in contact with the oysters they are an advantage in many ways, protecting the oysters both at high and low tide, absorbing carbon dioxide, and liberating oxygen, and giving attachment to hosts of diatoms that form the chief food of the oyster. Where weeds fall over and cover oysters during low tide, it is true, they tend to smother the oysters, but it is only for an interval when the oysters, if left uncovered, would have to close their shells and remain in a state of defence, while the weeds hold back some water, keeping the oysters moist and protecting against sun and dry air. Eel-grass is liable to be cut off by the sharp edges of the oysters and may be carried away by the tide or partly left to decay on the grounds. I have known a bed of eel-grass on which oysters had been planted to be stripped in one year, leaving the oysters exposed at low tide, silting up and not doing well, while beyond the oysters the eel-grass still remained.

Oysters are likely to be better for removal to new places, unless the latter are altogether unfavourable. Like people, they enjoy a change. In fact, the mere handling of them on the same bed does them good. If sunk somewhat in the soft bottom, or lying on the flat side, or on edge, or with the broad end sticking in the mud, a change to a fresh position will be welcome. The best position is lying flat with the deep (left) valve underneath, but, of course, it cannot be expected to place every oyster separately. Any change of position, change of bed, change of water, or change of food is likely to benefit them. They must not, however, be put where they will be overwhelmed with drift or sediment, or where too much exposed to sun, air, frost, fresh water, or water of too little salinity.

In collecting for the market large oysters may be picked out at low tide, leaving small ones for further growth. Or they may be all raked in heaps and carried by hand-barrows to a scow, on which men may work at sorting during high tide. Or the scow may be towed to wharf and the sorting take place with more comfort. In any case not only should the small free oysters be saved and replanted, but the small oysters and spat attached to the shells of the marketable oysters should be chipped off and returned to the water. They should not be kept long out of the water. Oysters procured by tongs or dredges can be treated in a similar manner. Unless the bed is purposely cleaned off for replanting there should be left scattered old oysters to serve as spawners. All empty shells and half-shells or shells of other molluscs should be left on the bed or, better, taken ashore and cleansed in sun and air to be used as cultch.

WORK ON ENVIRONMENT.

Our first knowledge of the proper environment of the oyster is obtained by observation of the best natural oyster areas compared with non-oyster-producing areas (report for 1915). Verifications and additions to this knowledge are made by experimenting with oysters in different localities or under different conditions to find what kind of a location or what condition is most successful (report for 1916). The knowledge may then be applied in converting poor areas and oysterless grounds into good oyster-producing areas. This is not always possible, but, unless the locality is altogether unfavourable, a good deal may be accomplished. It is more likely to

be successful on a coast or in a district where there are already some oysters or where oysters formerly existed than in places where oysters never have occurred. In the first case the temperature, salinity, depth of water, and nature of the bottom are more likely to be favourable, whereas in the last case the physical conditions may be quite incapable of adaptation. Old oyster-grounds may frequently be extended at the sides or similar grounds may be selected and improved in other parts of the bay or in other bays. It is a clear gain if unoccupied areas can be adapted and rendered productive.

Having selected a plot, the surface should be levelled in order to prevent oysters from being rolled into hollows by the tides and being covered with drift. Soft spots may be mixed with sand or gravel to give a uniformity of surface and keep tidal currents from cutting it into channels or hollows. A substratum of deep, soft mud may have the surface similarly stiffened to prevent oysters from sinking into it. At places where eel-grass grows too abundantly and too long it may be cut and sent adrift with the tide. A mowing-machine has been invented that can be attached to the front of a scow and have the cutting part lowered to suit the depth of the water. The knife is driven by a small engine on the scow and the latter is propelled or pulled along a rope that may be changed in position to cut successive swaths.

At some places various kinds of animals prey upon oysters with considerable destruction and need to be combated by the culturist. One of the most destructive is the starfish, which sometimes migrates in great numbers on to the oyster-beds. A starfish creeps over an oyster, fastens its numerous sucker-feet—some on one valve and some on the other—and exerts such a constant pull that in time the oyster tires and allows its shell to gape, when the starfish presses an arm between the valves and eventually brings its mouth with its everted stomach in contact with the soft flesh of the oyster. Small loose oysters may be swallowed whole and small attached ones may be covered and sucked to death. At no place on our coast have I found starfish in great abundance on oyster-beds, but I have been told they are more plentiful now than a few years ago on the Prince Edward Island beds. Starfish cannot withstand any great admixture of fresh water or a great degree of warmth, so that shallow water and exposed flats are unfavourable to their presence. They may be picked up at low tide and carried ashore. On deeper beds they may be taken on tangles or by a dredge and similarly treated.

Whelks, drills, or borers also do damage, but never to an alarming degree along our coast. They belong to the head-bearing molluscs with protrusible proboscis and rasping tongue by means of which they drill round holes through oyster or other shells and suck the soft flesh. At places they may occur in bunches on a water-soaked log, a seaweed, or the body of a dead fish, and may be scooped up and taken ashore. Where they are plentiful, as on parts of the coast of the United States, a sort of dredge is used having a slanting sieve through which the whelks can fall into a collecting-chamber while loose oysters and most other larger animals pass over the sieve and are left behind.

Many other animals work small damage, but small and constant losses amount to considerable in the aggregate. Sea-anemones, brittle-stars, worms, crabs, fish, birds, and seals can all do some injury to smaller or larger oysters, while eggs and larvæ may fall prey to great numbers of other animals that live by sweeping great quantities of the minutest organisms into their mouths. These animals are too small, too much hid, or too scattered to be effectively attacked by man without also doing injury to oysters. The only thing that can be done is to count on them and to raise such quantities of oysters that there will be plenty left after the toll is taken.

At low tide the best parts of natural oyster-grounds or planted beds or prospected areas may be staked out so that the tops of the stakes can be seen above high water, when scows loaded with oysters, shells, gravel, working implements, etc., may be left anchored or removed as required and planting, dredging, or other work done. Exposure of beds at low tide facilitates satisfactory observation of the distribution of the oysters, their condition as regards substratum, sediment, drift, undermining, healthfulness, growth, fattening, and many other things. The culturist will find plenty to occupy his time, attention, grasp of conditions, invention, and application of methods.

Construction-work such as depositing of gravel to prevent erosion and cutting of channels, the building of dykes to retain water and prevent exposure of oysters or their young to air, sun, and frost during the periods of low tide, the collecting of shells from unused areas and the depositing of them on the oyster-beds to improve the surface and increase the amount of cultch—these are some of the things to be attended to. The many possibilities in physical conditions and

outlay of the plant make it difficult to foresee all that may be required, but the intelligent and practical culturist will soon recognize from results what his particular case requires.

WORK ON CULTCH.

The importance of cultch can hardly be overestimated. Without cultch oyster-culture consists of little more than holding quantities of oysters over in a more or less safe and convenient place awaiting a good market price. They may be bought when the demand is low and oysters cheap; they may be transplanted when work is slack and least expensive; and they may be sold when they will net a profit. During the time of holding there may be some growth, but there will also be some loss. Extension of the time of storing and contribution of better attention may result in greater growth and more profit. A fresh stock has to be bought, shipped, handled, and cared for in the same manner. While both seller and buyer may make some gain, there is no increase in numbers of oysters and little increase in the amount of food-supply to the country. Any gain there is arises from speculation rather than from production. To increase the production other and better methods of handling oysters must be used, and of these the employment of cultch easily occupies first place.

In places where oysters live and reproduce naturally, and in places where oysters can be transplanted and live and reproduce, the natural rocks, stones, gravel, shells, and other hard objects may serve as natural cultch. But these are generally too much scattered, or are too few, or are in wrong places to serve the culturist. Rocks and stones are too permanent and the oysters that become fixed to them are either too difficult to separate or are not of sufficient numbers and size to be worth while collecting. These oysters, however, serve a good purpose in supplying eggs and keeping up the succession of generations. Patches of gravel and of shells are often too few or are in poor locations. Where practicable, stones and shells may be removed to better places. Heaps of stones were used in the ancient methods of Italy; but shells are lighter to handle and are easier from which to remove the oysters. The aggregation of oysters in the brush of fallen trees, the logs of wharves, the stakes, posts, or spars that mark out channels, the bottoms of boats, etc., is sufficient to suggest the putting-out of lumber for the collection of oysters. But lumber is expensive and not durable, and becomes covered with seaweeds, hydroids, barnacles, and other marine plants and animals. Many other materials have been experimented with, such as earthenware, scrap-tin, leather, canvas, netting, etc.; but even if these were satisfactory they are too expensive (excepting the small quantities discarded from their proper use). Old netting that is tarred has shown itself better than the untarred. Tarred brush, bark, shingles, etc., have been used. In Italy bundles of faggots (fascines) have been much employed; in Japan untrimmed stems of bamboo; in France, Belgium, and Holland split drain-pipes. These can be built up crossways so as to allow the sea-water (with the oyster larvæ) to perforate the piles and present an extensive and suitable surface. The rounded surfaces are placed upwards so as to shed the sediment while the hollow, under surfaces are kept clean and fresh. The practice of dipping in cement to give an artificial coating of a suitable smoothness or roughness has also made headway. This facilitates the chipping-off of the spat oysters when they are being thinned out. In the United States many tests have been made of the foregoing and other methods, but all forms of artificial cultch have gained little favour.

Shells are the most natural and best cultch. In places along beaches and on flats the bottom is white with them. Shell-heaps are to be found along shores where Indians formerly camped. Certain canneries throw out great heaps of shells as waste. In some places such shells have been used in making roads. Shucking-houses are sometimes glad to get rid of them. These are opportunities for the oyster-culturist. Where they occur such shells can be procured more conveniently and cheaper than any other form of cultch. Besides, in ease and cleanliness of handling, in extent and suitableness of surface, and in their gradual decay and the readiness with which the attached oysters become naturally or artificially separated, they can hardly be surpassed. The shells of oysters, clams, scallops, mussels, cockles, whelks, abalones, or other molluscs are all good, but those of oysters are best and most likely to be procurable in greatest abundance.

Old natural beds on the east coast often cover many acres of bottom, consisting of shells infiltrated with sediment several feet in depth. In Prince Edward Island great quantities of these shells used to be dredged up in winter through holes cut in the ice, by means of huge

frameworks supporting a beam and dredge worked by horses; and the shells with their contained sediment and disintegrated shell-matter were drawn away and left to soften and rot in heaps on the land, to be afterwards used as a fertilizer. This was rich in lime, but did not come up to expectations in enriching the soil and increasing the crops. Besides, the method of procuring it injured the beds by destroying their continuity, cutting great trenches through them and permitting the edges to fall in. Living oysters from the surface were taken among the rest or were buried by collapse of the banks, and mud was stirred up to settle upon and cover others. The harder shells could have been much more profitably used as cultch, but the farmers who took away the so-called "mussel-mud" were not generally oyster-fishers, and there was no inclination to work either for the good of the oysters or for the oyster-fishermen. It is only in recent years that claims can be obtained to private use of portions of oyster areas, so that a man may reap the benefits of his own improvements.

In the West there are no such beds, but what are called oyster-beds are no more than disconnected single layers of more or less separate and free oysters scattered over limited portions of beaches or flats. On account of the small size, thinness, and softness of the shells they do not last many years as cultch before they are completely broken up or crumbled away. But they are very efficient while they do last, for the spat collected by them is soon liberated by decay of the cultch, obviating much of the necessity of going over them to break apart the bunches. Cultch collected from this source does not accumulate very fast. A greater mass can be more easily obtained by raking up clam and cockle-shells where they keep working out of the mud, sand, or gravel bottom.

On account of the large size, thickness, and hardness of the eastern oyster-shell, it is a good thing to bring eastern oysters to the West and plant them out to grow for a year or two before sending to market. There will not be so many living oysters at the end of the period as at the beginning, but the growth may more than make up for the loss, and at the same time the shells of those that die will add to the cultch on the beds.

Eastern oysters marketed in the West are all sold complete—in the shell, the shell going with the meat and being carried off the beds and indeed away from the premises. In a similar manner they are retailed in the shell and become distributed in small quantities. They are generally served on the half-shell, but if any are shelled to be used otherwise the shells are thrown out, are carried away in the garbage, or form such small quantities as to be not worth the trouble of the culturist to have hunted up and returned. Western-oyster shells are easier to procure in this way on account of their being more often shelled in quantity at definite places. When bought back by the culturist they make excellent cultch. They are clean, so that all the surface is available for spat; they are not so large as to have vast numbers of spat fixed to one piece; they soften and break up easily, freeing the spat from undue crowding.

In collecting oysters for market, sorting, breaking apart bunches, thinning out, transplanting, and such operations, there occur numerous empty shells and separate valves of oysters, as well as some of other molluscs, and if all these are taken care of they soon accumulate to great heaps. Depending on the manner of working the beds, these may be wholly or in part left on the beds or aggregated at the wharf. Those collected at the wharf could be returned to the beds irregularly, at the convenience of the culturist, or could be kept in store for a more definite occasion. The oysterman who engages in the industry solely for the profit from handling more or less grown foreign oysters will perhaps regard these heaps as so much dead loss—indicating the hardships of his business. I have known of masses of such shells having been wasted to no better purpose than filling in a gully. This is still worse than in making a road-bed or in burning to lime. The shells left on the beds or returned to the beds not only improve the surface, but their decay adds to the available calcium carbonate required for the shells of growing oysters. The culturist who is engaged in the industry to satisfy both mental and bodily needs of employment, and at the same time to make the best use of every advantage that occurs, will preserve all shells for use as cultch, and in doing so will accomplish the before-mentioned purposes as well. To this end it becomes necessary to decide whether it is better to leave the shells on the beds or to take them ashore to be returned at a suitable later occasion.

In natural oyster districts oysters have been present for untold ages, and yet at most places the surface shells available as cultch continue to be limited in quantity. The natural accumulation of cultch is a slow process. It depends upon the capacity for production by the species and the capacity for destruction by the environment. Shells that have been buried under succeeding

layers, as in the great oyster-banks of eastern waters, or that have been covered with accumulated earth, as in Indian shell-heaps, have been longest preserved, because removed to the greatest extent from the action of the elements. The solvent action of water and the corrosive action of air, and the alternations between wet and dry and heat and cold, are chiefly instrumental in the decay of shells. On western beds the destruction soon balances up the production. The culturist cannot hope to maintain a stock except by continually collecting and preserving shells. They are less prone to decay on the land than on flats, but there is another and a better reason for retaining them on the land—viz., that it improves their effectiveness.

Oyster-culturists who have given attention to this point cannot have failed to observe that cultch which has been kept out of the water and cleansed is more successful than that which has remained in the water from year to year. My own observations of the several hundreds of tons of shells planted at Crescent during the four summers I was there were perfectly convincing. The scores of experiments I set partly for this purpose and partly for other purposes verified over and over the correctness of the conclusion. Day after day for long periods I have put out prepared shells in closed wire cases and examined the catch of spat and compared with the catch on old shells lying about the same places. When the former caught few to many spat the latter caught none to only an occasional one.

The reasons for this difference are not hard to find. It is self-evident that it is not due to the larvæ, for they are equally plentiful about all the shells. It is only necessary to compare the surfaces of the fresh and of the old cultch or to note the changes that come over fresh cultch as it stays in the water from day to day. The good cultch consisted of shells selected from the surface of heaps of shells that had been exposed for months to the air, sun, and rains, and had become quite clean and white. The old shells with which they were compared had lain in the water for indefinite periods and were discoloured, slimy, and dirty. The changes that come over freshly deposited clean shells are largely dependent upon the locality, the temperature and salinity of the water, and the amount of sediment in suspension. It is generally possible to note a difference in a single tide or a single day, but in two or three days the difference becomes marked. A fine dust-like deposit may be first observed; then a somewhat slimy surface which soon shows specks and patches of organic matter that are fixed to the surface and do not wash off by moving the shell through the water; these accumulate a greater deposit and increase in size and number until a great part or the whole of the shell is covered and dirty. If instead of shells strips of glass are used the surface can be examined with a microscope and the nature of the deposits recognized. The organic matters are minute, separate, or colonial plants or animals or exudations from them causing the slimy surface and the retention of silt.

When single valves of shells are dropped into the water separately they fall with the convex surface downwards and concavity upwards. A good portion of the under side rests on or becomes pressed into the substratum and the concavity soon comes to be partly filled with sediment. The only portions left exposed are the upper and lower margins and edges of the shell, which are themselves subject to the organic deposits already referred to. This is why so many shells are found with spat clustered round the margins. The at first complete and suitable surfaces of the shells are liable to be soon reduced to narrow rims of a less suitable surface. At some places this can happen in a few days; at others it may take as many weeks. This is why prepared cultch, if put down at the proper time, is more efficient than old cultch. Shells that fall without interference light on the convex surface, only part of which touches, and all the rest of both surfaces are at first free and suitable to catch spat. Spat that becomes attached in the centre of the concave surface may be afterwards covered with sediment and smothered or starved. When shells are shovelled from a scow into the water at high tide they may, in falling through the water, interfere with one another or be affected by a current, so that some of them will light with the hollow side downwards. If they fall on hard bottom the greater part of the under surface is likely to be still accessible to larvæ and offers very satisfactory conditions. The worst chance is that depositing sediment may rise round the edges, cutting off communication with the outside. The upper side is also favourable because of its rounded surface allowing the sediment to slip off. But both surfaces are exposed to organic growths. Some of the densest clusters of spat are to be found on the insides of cockle-shells where the valves have been retained intact and so closely fitting that one at first wonders how the spat got inside, which becomes plain when it is remembered that it is not the spat but the minute larva that searches out the place for fixation.

From the preceding considerations it follows that the work on cultch should consist of collecting shells from all possible sources (even to buying them), spreading them out on hard ground (or lumber platform), and shovelling them over once in a while to let the dried mud fall out of them and expose all surfaces until they are clean, dry, and white. In this condition they can be held in readiness for the proper time to plant. The planting itself is best carried out, like the planting of seed-oysters, by being scattered at high tide from a scow as it is being towed back and forward over the bed.

The Time to plant Cultch.

The importance of cultch has been already insisted on. But this presupposes a proper handling of the cultch. To be successful, it must be good cultch, it must be put down in a suitable place, it must be spread in an approved manner, and, above all, it must be planted at a well-judged time.

The more or less accidental observations that originally suggested the possibility of oyster-culture could have no reference to such special points. Oysters large enough or plentiful enough to attract the attention of men engaged in other pursuits were already too old to furnish a clue as to their origin. An unused boat, an anchor, a fallen tree, or some such object with spat attached may have first served to limit the time to within a few months. It might even have been observed that spat did not come into existence in the winter, but in the warm season of the year.

To follow the subject more closely required progress in the knowledge of the developing young, the small size of which rendered this impossible before the microscope came into use. The egg was first observed in 1690. Isolated scraps of information were added by a long list of noted zoologists, but especially by Brach (1690), Leeuenhoek (1695), Baster (1759), Home (1826), Davaine (1852), Lacaze-Duthiers (1854), Coste (1861), De la Blanchère (1866), Gwyn-Jeffreys (1869), Saunders (1873), Salensky (1883), Möbius (1877), Bouchon-Brandeley (1882), Horst (1883, 1884), Hubrecht (1883), Huxley (1883), Hoek (1884), all working on the European oyster. The American species was especially investigated by Brooks (1879), Ryder (1881), Rice (1883), Winslow (1884), Jackson (1888), Nelson (1888-1915). United States investigators have been prone to believe that the straight-hinge larva becomes transformed into the spat, and many expensive experiments have been carried out and failed because of this mistake. Even Nelson, whose work began in 1888 and continued to 1915, did not begin to get away from this idea until 1907, and he appears to have been still under its spell when he wrote his very last report, where he states: "The Canadian oyster-spat, at the time of fixation to cultch, is a fourth larger than the spat in the corresponding stage of development in New Jersey waters."

"The Canadian oyster-spat, at the time of fixation to cultch, is a fourth larger than the spat in the corresponding stage of development in New Jersey waters."

As the spat at the time of fixation has the same size and organization as the larva immediately before fixation, it would follow that the full-grown New Jersey larva is a fifth smaller than the full-grown Canadian larva—and the larva or spat of 55 units length in Canada would correspond with a larva or spat of 44 units length in New Jersey. I have elsewhere shown ("The Canadian Oyster" and other reports) that the common size for fixation of the eastern oyster of Canada is 55 units (=0.379 mm.) and of the western oyster of Canada is 37 units (=0.255 mm.). The circumstance is suggestive that the New Jersey oyster may be a different species from the more northern Canadian, and, in fact, Nelson makes the statement: "It is still somewhat doubtful whether the Canadian oyster may not be a distinct variety, breeding true to its kind." But there is another alternative which seems to have escaped Nelson—viz., that the larvæ of the same species might set at different ages and sizes in northern and southern climates.

In looking through Nelson's former publications for some reference to measurements of New Jersey larvæ, I find (1907): "The actual size of the larval shell at times of setting is one-fiftieth of an inch in length" (=0.5 mm.). Measurements of "newly attached spat" of his Plate II. when divided by their stated magnifications give 0.5 and 0.425 mm., which are larger than Nelson's own measurements of the largest Canadian larvæ (400 microns=0.4 mm.). According to his own figures, I do not see how it is possible to make the statement about the relative sizes of New Jersey and Canadian spat, unless in his latest paper he meant to retract his earlier measurements as being inaccurate. My own largest measurement of a Canadian larva is 0.386 mm. in length, and I find no constant or noticeable difference in larvæ of the same species at the extremes of northern and southern distribution, either on the Atlantic or on the Pacific.

The bearing of the subject upon some phases of culture and of transplantation induced me to write to the United States Bureau of Fisheries, asking if it were possible for one of their investigators

to procure and send me samples of plankton taken above oyster-beds and of young spat. The plankton was not successful, but the spat were satisfactory. Comparing them with some of my own from eastern Canada, I find they agree in every respect.

The full-grown larva of the Atlantic oyster was first discovered and described by the writer in 1904. Its external features, size, shape, asymmetry, high umbos, internal structure, foot, gills, and many other organs were then comprehended for the first time in the history of the subject. At the same time the other phases of the life of the larva—viz., the place and time at which it is to be found and the manner in which it may be obtained, as well as the bearing up the subject of oyster-culture—were referred to. These have all been further elaborated in my later works, so that it would now be possible to write a more complete and comprehensive account of the life-history of the oyster than has ever hitherto been presented.

The Pacific oyster agrees in all essential features with the Atlantic species. All lines of research—embryology, anatomy and physiology, environment, culture—have been investigated by the writer and have received equal attention. Before 1911 there was nothing known of it but its external features and its distribution, and these only very imperfectly. All the rest has been written by myself.

The final application of the knowledge gained from both species, so far as oyster-culture is concerned, centres in the intelligent use of cultch, or, to be still more precise, in the proper time to plant cultch. This point, although insisted on in several of my earlier works, has not yet received the attention that is its due. It takes a long time for most scientific facts, principles, or methods to filter down among the masses.

In the northern part of British Columbia I met a man working in a salmon-cannery who told me he had formerly been employed by an oyster company at Whitstable, England, and that he knew "all about the oyster." So insistant was he in repeating the statement that I ventured to ask: "Perhaps you won't mind telling me how long it takes an oyster-egg to become a spat?" He was somewhat staggered, but replied: "Oh, I don't know anything about that."

At Willapa Harbour (Shoalwater Bay), Washington, in talking to a culturist from the East, I was asked a similar question, and upon its being answered he appeared bewildered, and said: "Well, that is very different from what we have always heard."

A seed-oyster producer of New York, after having written many times, called on me. In discussing the points about which he was particularly interested he became frank in expressing his views—one of which was that "The professors have never done anything for oyster-culture and do not attack the problems that occur at the great oyster centres." I did not waste time to disillusion him. Any man in a receptive mood and seeking for information should be helped, but one so badly informed and decided in his views is beyond hope. I might have answered: "On the contrary, zoologists have done nearly everything that has been done; oyster fishermen, growers, and handlers would never have got the information; Brooks, Nelson, and others have certainly worked at the best centres; but it is not necessary to even do this; where nature unassisted produces a lavish supply there is little credit to be taken by the culturist; if good results can be obtained in poor centres it is a sure proof of the value of the method."

When I first went to Crescent and a notice of my purpose had got into the papers I was bombarded with letters asking for "private tips." These were not from oyster-culturists and I did not answer them. I am not concerned with greedy money-grabbers who are looking for unfair advantages. I care only for the subject—the gaining of correct information, the improvement of the industry, the furnishing of a larger food-supply. I write for the masses; it is their privilege to make use of or to reject my methods.

From the observation that small oysters are sometimes found attached to hard objects in the water of shallow bays and estuaries it is but a short step to the putting-out of cultch for the purpose of collecting spat. There is little use of planting cultch in autumn, winter, or early spring—it does not catch spat then. There has grown up a practice among oyster-culturists of putting out cultch at certain times in much the same way as farmers plant seeds or sow grain at certain times. Seeds planted too soon might rot before the proper conditions for their germination arrived, while if planted too late the growth might not reach maturity before the cold weather interfered. In the case of the oyster the egg and succeeding stages (which correspond to the seeds of plants) are not matured and extruded into the water until the warm weather arrives. If they were under the control of man he would no doubt make mistakes and bring about spawning at wrong times, but fortunately they are under the control of natural forces. That which is under the control of man is the power of putting out cultch at the proper time to accommodate the developing oyster. If cultch is put out too soon it is liable to sink into the soft substratum, to become covered with sediment, to be overgrown with plant or animal colonies, and to become coated with an organic slime. To such an extent may one or more of such processes take place that the available exposed surface is much restricted and the efficacy

of the cultch reduced to only a small fraction of what it was originally. The longer the cultch is in the water the more this is the case. It is of great advantage to delay planting cultch until the very beginning of the time when it will be useful. To determine this time is the problem.

The time to put out cultch has been and still is largely judged by the results of previous plantings—i.e., by experience. A sort of customary time—about the last of June or first of July—has been arrived at. But this is not equally good for all places. It may be a little late for places to the south or somewhat early for those to the north. Then, again, it is not equally good for all years, for the warm weather of one summer may be considerably earlier than for another. There are other things that may interfere, such as sudden changes of temperature or a heavy fall of rain. It is useful to have in mind some approximately correct time as a reminder that certain preparations should be commenced, but the actual time cannot be foretold with accuracy for any considerable period in advance. It has to be determined for each year and, in fact, for each locality, except where places are near together and under like conditions.

Another way of obtaining information about the time to put out cultch is to open oysters from time to time to find out if they are becoming richer in colour and more swollen with reproductive matter. When ova or sperm are approaching ripeness some may be squeezed from the reproductive openings by lightly stroking the side of the abdomen. If the cells cling to one another in masses they are not yet ripe, but if they separate into individuals they may be fully mature. To be still more certain they may be examined with a microscope and a fertilization experiment may be performed.

Observation of the actual process of spawning can be seldom carried out. It is not a sufficiently conspicuous phenomenon to be depended upon as an indication of the time of ripeness and may slip by without being noticed. I have seen both Atlantic and Pacific oysters in the act of spawning. In the first the very small eggs (or sperm) are expelled with a squirting noise and can be seen as a little white cloud in the water, dispersing as it settles to the bottom. When the oysters are lying on the warm flats instead of being covered with water, the squirt can be heard and seen and the spawn remains as a white deposit on the oyster or other near objects. This phenomenon is, as stated, rarely to be observed, but what can be noted is the occurrence of thin, dark-coloured, spent individuals, that have spawned out, increasing in numbers, while the plump, fresh, healthy individuals, that have not yet spawned, are decreasing in numbers. In the Pacific species the much larger and heavier eggs drop into the gill-cavities and mantle-chamber, where they lie for some days undergoing development, and only pass to the outside when they have attained to some stage of the straight-hinge larva. This is an advantage that the western oyster offers over the eastern, for on opening them the culturist can easily recognize the soup-like spawn lying about the gills. It varies in colour from white through grey to brown, according to the age. The young white eggs are quite motionless, but the late grey or brown larvæ are active swimmers, best seen under a lens or microscope.

As long as it was believed that eggs become spawned, fertilized, developed, and set as spat in a few hours (or days), the time of spawning could be accepted as near enough to the time of spatting to be used as a sign for the planting of cultch. As already mentioned, the writer showed that this was a mistake and that it required a month instead of a few hours for the process. The elaborate experiments of Ryder, as well as the simpler ones of Rice, Winslow, Nelson, and others in the United States, could hardly have succeeded against such miscalculation. Any results that were obtained were due to other (earlier) eggs than those counted on. Cultch put out a month in advance of the time when the young oysters will be ready to make use of it will become greatly reduced in efficiency in the meantime. There is no use of going to the expense of time, labour, or money in collecting, preparing, and cleansing cultch for that purpose. Besides, many things can happen the developing young in this period. Of the myriads of eggs spawned at the beginning of the period there may be very few larvæ to represent them towards the end of the period. Records of previous plantings, evidence from the appearances of the oysters, ripening of eggs, spawning, fertilization, beginning of development, are all helpful as bits of information, but they are all too far anterior to the setting of the spat to be depended upon. It is evident something more is required.

The only accurate, strictly scientific, and satisfactory method of acquiring the knowledge of when to plant cultch is the plankton method. It begins where the other methods leave off and continues the following-up of the young throughout the period of time that elapses between spawning and spatting—i.e., throughout the month required for the development to the full-grown

larva. It supplies the information of where the young are and what they are doing during this period. For the eastern oyster all stages of development between the egg and the spat are in the water about the parent oysters. For the western oyster the eggs and younger stages of development are retained in the mantle-cavity of the mother for about half the period, and the later stages from the straight-hinge to the full-grown umbo stage of the larva, are free in the water above oyster-beds. The free-living larvæ of both species can only be obtained for observation by some adaptation of the plankton method such as was first applied by myself. All the literature of this subject, with the exception of the little that has been copied by others without acknowledgment, has been written by myself. It includes the facts of their existence, their appearance, measurements, shape, and organization, the distinctions from other bivalve-larvæ and other plankton organisms, the time of year, place of occurrence, manner of life, rate of growth, age, when and at what size full-grown—in fact, all that seems useful to know about when, where, and how to procure, observe, and recognize the larvæ.

Up to the time of the earliest spawning and for one or two weeks afterwards there are no shell-bearing oyster larvæ in the water and consequently none in plankton collections. About two weeks after spawning has begun there appear little straight-hinge oyster larvæ in the catches. From this time onwards there come to be several sizes; the earliest have grown older and larger and other broods of younger and smaller larvæ have come on. The oldest grow to a limit in size beyond which there are no representatives in the plankton collections. They either become set as spat or they perish for lack of cultch or from other causes. In good places it is possible to go on taking plankton with oyster larvæ of various sizes in it for two or three months. As soon as one brood grows up and disappears a new brood ordinarily takes its place, so that the collections preserve a certain uniformity of appearance, although it is not from the same larvæ or the same broods. But the broods are not equal in numbers of individuals. The first that come on are few because they are from eggs that were spawned at the beginning of the warm weather, when only those oysters were ready to spawn that were in most favourable places. A little later a much greater number of oysters would be ready to spawn at one time. If the culturist has kept in touch with the conditions of the oysters on the beds he will know when the greatest amount of spawning has taken place and at what time to expect the largest swarms of larvæ. His plankton catches should agree with and verify this information and show when there will be the greatest number of full-grown larvæ in the water ready to set as spat. *This is the time to plant cultch.* As soon as the first of these larvæ attain to the maximum size the prepared shells should be distributed so as to offer a vast and suitable surface for attachment at a time when the masses are ripe for fixation. Good, fresh, clean, white shells put out at the time when there is an abundance of full-grown oyster larvæ in the water searching for places for attachment cannot fail to catch a good set of spat.

This is the information to which all my observations of structure, development, habits, and surroundings converge, as well as to which all my experiments point—when to bring together these two most important factors of abundance of full-grown larvæ and abundance of suitable cultch. The successful capture of immense numbers of spat is not only the cheapest way of obtaining one's own seed, but is the most satisfying intellectual and practical achievement within the grasp of the culturist.

All the information gained from former experience, from the examination of ripening oysters, from the observation of the process of spawning, from the finding of spawned-out individuals, from the procuring of older and younger broods of larvæ in the plankton collections, even from the putting-out of a few shells to see if occasional specimens of spat can be secured from the earliest broods of larvæ; all this information fits together as one piece and points to one conclusion—the proper time to plant prepared cultch. If this occasion is allowed to pass by unused the labour of gaining the information as well as of procuring, preparing, and planting of the cultch is largely lost. Cultch is of no use unless it is planted. If put out late it may still secure a fair although not so great a set. It is not possible to catch too many spat. If not captured in this way they will inevitably be lost. There may be more attached to some pieces of cultch than can find room to grow, but other pieces will not be overstocked. The loss from the many accidents to which they are exposed will not fail to thin them out in the end.

There is another reason why it is advisable to get the cultch into the water for the first large swarm of larvæ. Early spat are likely to have advantages over late ones in the fact that they have before them a longer period of warm weather and abundant food and will be

larger, stronger, and better protected to withstand the approaching winter. But it may not be good policy to plant shells for the very first swarms of larvæ because of their small numbers. The culturist needs to know his grounds as well as to know his oysters. If the locality is one that rapidly reduces the efficiency of cultch there is all the more necessity to play for the quick capture of a great number of spat—i.e., to put out the shells to accommodate the largest brood. If, on the other hand, cultch does not become very rapidly coated it may be safe to risk the chances of obtaining small contributions from successive broods. When once in the water shells are likely to receive fresh additions of spat as long as there are any larvæ left. The cultch supplied for the largest brood also has this advantage.

It may appear that since larvæ are in the water for so long a period there need be no concern about putting out cultch to suit the requirements of the first or any other large brood—that the continual accession of occasional spat from small broods will total a fair set in the end. But this reasoning is not safe. The study of plankton collections shows that the total number of larvæ in the water from time to time is subject to great fluctuation, as is also the total number of full-grown larvæ. It is the latter the culturist should count on in putting out shells. There are times when for days there are scarcely any to be found, and if cultch happens to be put out at such a time there will be next to no spat secured and the cultch will be deteriorating while the younger broods are growing up to the spatting stage. The cause for the fluctuation may have existed a month previously, when the eggs were spawned, or may have happened at any time during the previous month, when great numbers of larvæ have been destroyed. A cold spell of weather, a protracted rain, or a scarcity of food may have operated to prevent the ripening of eggs, the spawning, the fertilization, or the development.

There is still left one method of judging the time to plant cultch, and that is to keep watch on old shells or, better, to put out a few good shells and examine them for spat. Of course, this method is open to the objection that the first good fall of spat may be past before the culturist becomes aware of the presence of spat and before he has the bulk of his cultch planted. The method, however, can be used in combination with the other methods to advantage, in that while the full-grown larvæ are still few in numbers the culturist may capture occasional spat and even recognize an increasing number which will add to his assurance that he is on the right road.

Special Work.

The culturist who is in contact with the same areas from year to year is in the best position to detect and follow up the special problems of the district. He should become interested in the subject in other than financial aspects. He may not be able to apply the most technical methods and reach the most accurate conclusions, but he will soon discover whether he is increasing the production or not. Mechanical repetition of a set course of action is not likely to improve his methods. It is quite unnecessary to risk any suggested change on a large scale. A small, perhaps somewhat isolated, area may be set apart for an experiment. He should aim at finding the best grounds for spatting, for growing, for fattening, for keeping over winter, etc. He could make observations on the rate of development and rate of growth, the conditions under which discoloured oysters (black, green, red) are produced, and the local causes of death among the oysters.

A subject of great importance is that of food. The contents of the stomachs of oysters may be withdrawn by means of a pipette and examined under a microscope to see the kinds and quantities of food-organisms that have been swallowed. Search can be made on eel-grass and other seaweeds and in plankton collections for the same organisms in order to learn where they are produced. These places should then be tried by planting oysters on them and noting the growth.

Different conditions of the bottom and of the water may be tested; continuous submersion or periodical exposure, stagnant or flowing water, gravelly or muddy substratum, sloughs, pools, lagoons, artificial ponds, dyked areas, salinity, temperature, etc.

Oysters transplanted from other districts should be observed with a view to determining the best sources from which to draw. Observations having an apparent local value may be found by comparison to possess a broader significance.

TRADE AND COMMERCE.

There is no need to dwell here on such subjects as finding a market, sorting to a uniformity with the sample, the use of trade-names, catering to the tastes of the people, greening, bleaching, freshening, etc., that hardly fall within the scope of this work.

Fig. 1. Planting seed-oysters at low tide.

Fig. 2. Thinning out at low tide.

Fig. 3. Collecting native oysters.

Fig. 4. Towing to wharf at high tide.

THE SOCKEYE RUN ON THE FRASER RIVER: ITS PRESENT CONDITION AND ITS FUTURE PROSPECTS.

By C. H. Gilbert.

The history of the Fraser River sockeye runs shows unmistakably that the three small years of each four-year cycle were overfished early in the history of the industry, and immediately showed the effects of serious depletion. These effects have continued in increasing measure to the present day, when we have but small remains of the generous runs with which the industry began.

During the early years, when fishing was confined to the region about the mouth of the river and drift gill-nets alone were employed, no evidence exists of overfishing. The last cycle in which these conditions obtained was 1894-96. During each of the small years of that cycle (1894, 1895, and 1896) there were packed approximately 350,000 cases on the Fraser River and about 60,000 cases on Puget Sound. During each of those years, therefore, about 5,000,000 sockeye were taken from the spawning run and used for commercial purposes. It should have been considered at that time an open question whether enough salmon to keep the runs going had been permitted to escape to the spawning-grounds. Strict inquiry should have been made to ascertain whether, in addition to a surplus of individuals which could be spared, we had encroached on the spawning reserve, with the certain result that the runs would show a falling-off.

Apparently, however, a third of a million cases a year could be safely spared, for the following cycle shows no decrease. If from the beginning the pack had been limited to a third of a million cases for each small year, apparently the runs would still continue in their primitive abundance. During the three small years of this cycle approximately 1,200,000 cases were packed.

But in the following period of four years (1897, 1898, 1899, and 1900) the traps on Puget Sound became an important factor. While the British Columbia pack showed little or no reduction, it was now met by a pack on Puget Sound which nearly equalled it. The total captures during the three off-years of this cycle nearly doubled those of the preceding years and exacted an average toll of about 10,000,000 fish from the spawning run of these years. The total pack of the three years of this cycle was over 2,000,000 cases.

The result was quickly apparent. If 5,000,000 fish could be safely spared, this figure nevertheless must have been near the upper limit of safety, for when 10,000,000 fish were abstracted the small years of the following cycle showed such a marked decline as to indicate that we had far overstepped the line of safety. It was then during the cycle of 1897-1900 that the first serious damage was done to the sockeye runs of the Fraser River. By doubling the pack of the three small years, not only was the surplus fully taken, but the necessary spawning reserve was seriously encroached on, with the result that in the small years of the following cycle (1902, 1903, and 1904), in spite of the increased amount of gear employed, the pack was cut in half, while the spawning-beds at the same time were but sparsely seeded.

Is it any wonder that the voice of my friend and colleague, J. P. Babcock, of the Fisheries Department of British Columbia, was raised insistently in warning and protest! The inevitable and disastrous trend of events should have been evident to the dullest. But the parties in interest refused to hold their hands and proceeded with the slaughter of the spawning remnant, while politically controlled Commissions of Fisheries smugly reported "business as usual" and tacitly encouraged the good work to go on.

The result, as I have remarked, was quickly apparent. In 1902, 1903, and 1904 the total sockeye-pack of the Fraser was cut to 1,200,000 cases, and in succeeding years it has suffered still further reduction, the pack of the three off-years of a cycle never again equalling 1,000,000 cases. In 1906-8 it was 750,000 cases; in 1910-12, 880,000 cases; in 1914-16, 796,000. And with each year the amount of gear employed has increased by leaps and bounds. The small years of the present cycle may be expected to register a smaller total than any which have gone before.

As regards the big years of their respective cycles, it could not be shown prior to 1913 that any permanent impairment of the runs had occurred. But the accidental blockade of the canyon

during that year prevented in large measure the seeding of the up-river spawning-beds. The fish that should have reached them died without spawning below the canyon. The results were only too conspicuous in 1917, and show beyond question that the blocking of the canyon was a disaster of the first magnitude. It has destroyed the big run for all time, unless extraordinary measures are taken to restore it. The "big year" must now range itself in size and importance with the "off-years." There is no reason to hope that 1921 will even equal 1917, much less surpass it. So closely were the sockeye gleaned this past season that the proportion of escape was reduced to a minimum. The reports of Mr. Babcock concerning the condition of the spawning-beds indicate that far less spawn was deposited than in 1913. There is no reason to hope that any measures would be effective in now restoring the "big year" of the cycle, which would not be equally effective with the "off-years."

These are the facts with which we are confronted: The three off-years very seriously impaired, with an almost certain prospect of worse to come during the present cycle; and the big year on which we have principally relied heretofore, a thing of the past. Nothing short of heroic remedies can restore the Fraser to even a fair measure of productivity. Yet the spawning-grounds are uninjured and unsurrounded by any large populations of either natives or whites, and the river-channels are unpolluted. The fields are ready as ever for the harvest. We need but to spare the seed.

In planning to replenish a sockeye-stream the question is at once raised: "To what extent can we depend on hatcheries?" Unfortunately no certain answer can be returned to this question. Certain sources of waste and loss in natural spawning are undoubtedly eliminated in the hatcheries. The dangers which threaten the eggs—and these are many and serious—may be largely avoided. From a given quantity of eggs the hatcheries without doubt can produce a much larger number of fry than is possible in natural propagation. Such doubts as we may entertain concerning the effectiveness of sockeye-hatcheries must deal, it would seem, with less favourable conditions under which the fry are liberated, and possibly the less active avoidance of their enemies on the part of hatchery-raised fish. Some of these dangers may be minimized by the adoption of better methods. Certain it is, much of the hatchery-work has been done with little intelligence and less conscientiousness. Much better records may be made in the future. But to the present time there is little to indicate a high efficiency of sockeye-hatcheries. Sockeye-streams in Alaska or elsewhere, which are provided with hatcheries, seem to conserve their runs little, if any, better than the streams without hatcheries. And specially successful years at the hatcheries have not been followed by increase of the runs.

It is clear, then, that in planning the rehabilitation of the Fraser River it will be unwise to place too much dependence on the work of hatcheries. Measures should be adopted which will promise results in any case, and then the help of the hatcheries availed of to the full extent that they can furnish aid. In any event, the hatcheries can work no miracles, and can produce no salmon-fry without salmon-eggs. And it must be borne in mind that on the upper river, where are located the greatest spawning-beds of the river-basin, no hatchery can now operate, because spawning fish no longer reach this section in sufficient numbers to furnish the eggs. The hatcheries located on the upper river have been compelled to close their doors, so greatly since they were built have the runs become depleted.

The one all-important remedy for the existing situation is to permit more fish—many more fish—to escape capture and become spawners. Until adequate measures are taken to that end it is useless to discuss any minor remedies. If we hope for results, we must act in no picayunish fashion—we must deal in large quantities. The mortality among salmon is great. At every stage of their lives their enemies in infinite numbers and variety lie in wait. A sockeye-egg, under natural conditions, has not more than one chance in a thousand to develop and survive to maturity. If a female lays 2,000 eggs—and this is not far from the usual number—not more than two of these on the average will proceed to sea, escape their enemies, and return to spawn at term. Nature has set the scene for a vast slaughter. The utmost we can ever accomplish by way of protection covers only the life of the egg and the younger stages of the fry. Beyond that, Nature will have its way and will take its vast toll. To keep a stream stocked with salmon this wastage must be allowed for. An extensive spawning run must be maintained, all the more extensive if, as in the present case, the stock of salmon is already seriously depleted and we wish to restore it.

The Fraser River presents unexampled opportunities for productiveness and wealth. The people need the enormous supplies of highly valuable food which the river is able to produce annually. It should not be permitted to remain at its present low rate of production. Those now engaged in the industry of preparing this food product for market should voluntarily surrender for purposes of propagation such quota of the run as will not only arrest the process of depletion, but will restore the runs. If they are unable to agree on this, the Governments should step in and control the matter. In no way can the Governments escape the responsibility. The people need the food. They will come to need it in future years even more sorely than they do at the present. No private interests should be permitted to stand in the way of restoring this producer of food to the public.

If the Fraser River were a private monopoly, to be henceforth wisely handled, there can be no doubt it would now be promptly closed to commercial fishing for a term of years, and the entire run—now so sadly dwindled—dedicated to purposes of propagation. This should be done without further delay for at least one cycle of four years, and the results carefully noted by a continued study of the spawning-beds. Fortunately, there now exists adequate data for comparison. No other sockeye-stream has received such close and discriminating study. Through the wise efforts of J. P. Babcock, annual inspection has been made of the spawning-beds of the entire watershed, and predictions of the runs four years thence have been fearlessly made. It is a matter of record how consistently these prophecies have been fulfilled. We are now, therefore, in possession of information to enable us to judge with some degree of accuracy the effects of any remedial measures we may adopt. If the river were closed to fishing for one cycle of four years, we could know fairly well in advance what the result was to be, and could then either open the river and sound to restricted fishing, if the condition should warrant, or if necessary close it for a further period of four years. This is the only method to restore the sockeye run with any promptness and with any certainty of success.

So great has been the reduction of the runs, we cannot predict with any optimism what would be the result of less drastic measures. If the amount of fishing-gear in use be limited and the weekly closed season be extended, undoubtedly a somewhat larger proportion of fish would reach the spawning-beds. But it must be borne in mind that it is not the proportion of a given run which spells success, but the actual number of spawners. The whole of a sadly depleted run may be all too few to produce the desired results. It is greatly to be feared that any restrictions in the present case which would be so moderate as still to leave it profitable for canneries to operate in the face of such reduced runs can accomplish little or nothing towards the restocking of the river. The only wise course—the only adequate remedy—is to close the river for a term of years, by concurrent action of the two Governments. We might, of course, do nothing, and thus permit the run to decline to a point where commercial fishing would become largely if not wholly unprofitable—in the hope that when parties in interest no longer existed it might be possible to adopt such measures as would then build the run up again. But in that case a still longer period would be necessary, with far less probability of success.

SALMON-FISHERY OF THE FRASER RIVER DISTRICT.*

BY JOHN PEASE BABCOCK, ASSISTANT COMMISSIONER OF FISHERIES, BRITISH COLUMBIA.

The sockeye salmon which frequent the Fraser River in British Columbia are natives of that stream. All of them are hatched in its watershed, and, with few exceptions, spend the first year of their life in the fresh waters of some one of its many large lakes. They then migrate to the sea, where they remain until the summer of the year they are four years old, when they again seek the waters of the Fraser to spawn, and, after spawning, die.

In returning from the sea to the Fraser the salmon pass through many miles of American waters in the State of Washington, and there the greater proportion of the run is caught by American fishermen. It is this feature of the fishery that makes it an international one. In dealing with the salmon-fisheries of the Fraser it is necessary to deal also with the fishing operations carried on in American waters through which they pass, since it has been demonstrated that all the sockeye salmon which are taken in Puget Sound, in the State of Washington, are Fraser River bred fish. The term "Fraser River District" is here used to include all the American and Canadian waters in which the Fraser River fish are caught. In order to show an increase or decrease in the run of sockeye to the Fraser for a given year it is necessary to compare the catch of that year with the catch in the fourth preceding year, since, as already set forth, the sockeye that run to that river predominantly mature in four years, and since the sockeye seeking the Fraser are caught in both Canadian and American waters it is necessary to take the combined catch in those waters in order to ascertain the total for any year.

Up to the present year (1917) the run of sockeye salmon to the Fraser River District made it the most valuable and at the same time the most remarkable salmon-fishery known. Every fourth year, up to 1917, the run of sockeye salmon in that district has greatly exceeded the run to any other river, and has so greatly exceeded the run to the Fraser in the three following years that it is termed "the run of the big year." The run to the Fraser in each of the three years succeeding the big year is so much smaller that those years are termed "the lean years."

ANALYSIS OF PACK.

Nineteen hundred and nine was a year of a "big run." The pack in the district that year totalled 1,683,339 cases, each case containing forty-eight 1-lb. cans or their equivalent. The *combined* pack of the three following lean years totalled but 893,253 cases, or 53 per cent. of that of 1909.

The pack in 1913, the next big year (and, as will later be shown, to have been the *last* big year), totalled 2,392,895 cases, while the *combined* pack in the three following lean years totalled but 805,910 cases, or 35 per cent. of that of 1913.

A study of the recorded pack of sockeye salmon caught in the Fraser River District for the past eight years, 1909 to 1916, inclusive, affords a comprehensive basis for an understanding of conditions in both Provincial and State waters of that district up to 1917. It demonstrates the vast difference between the catch in the big and in the lean years up to that year, as well as the great difference in the proportion of the catch in the Provincial and the State waters, and it also shows the decline in the run in the lean years.

PACK OF SOCKEYE SALMON CAUGHT IN FRASER RIVER DISTRICT, 1909-1917.

Year.	British Columbia Waters.	State of Washington Waters.†	Total for District.
1909	585,435	1,097,904	1,683,339
1910	150,432	248,014	398,446
1911	58,487	127,761	186,248
1912	123,879	184,680	308,559
1913	719,796	1,673,099	2,392,895
1914	198,183	335,230	533,413
1915	91,130	64,584	155,714
1916	32,146	84,637	116,783
Totals, 1909-1916	1,959,488	3,815,909	5,775,397
1917	148,164	300,000‡	448,164

* Reprint from Commission of Conservation Report for 1917.
† Data from *Pacific Fisherman*, Seattle, Wash. ‡ Estimate.

The pack for the eight years, 1909 to 1916, inclusive, includes the catch of the last two big years and the last six lean years. Together they constitute the last two four-year cycles of the run to the Fraser River. The grand total for the eight years is 5,775,397 cases, of which 33.9 per cent. was packed in British Columbia and 66.1 per cent. in the State of Washington. In every recent year, except 1915, the catch in the State of Washington waters of the district has exceeded the catch in British Columbia waters. In the two big years the pack from Washington waters exceeded the pack from British Columbia waters by more than 100 per cent., and in 1913 it exceeded the combined pack in the British Columbia waters of the last two big years, 1909 and 1913. The pack in Washington in the six lean years exceeded the pack in British Columbia waters in the same years by 157 per cent. The decline in the catch in the lean years is pronounced. The catch in Provincial waters in 1916 was only 26 per cent. of that of the previous fourth year, and was 91,733 cases less than in 1912. In 1916 the pack in Washington was 100,043 cases less, or 45.8 per cent., than in 1912, four years previous.

The final figures for the pack of sockeye in the Fraser River District for 1917 are not yet available. The pack in British Columbia waters was 148,166 cases and the pack in the State of Washington is estimated at 300,000 cases, a total for the district of 448,164 cases. This is only one-sixth of the pack of the previous big year, 1913, and shows a decrease of 1,944,731 cases, or more than 81 per cent.

Depletion of Run.

It has been demonstrated in the reports of the British Columbia Fisheries Department, and by the findings of two international commissions, that the sockeye caught in the Fraser River District are predominantly four-year-olds, are all hatched in the watershed of the Fraser, in British Columbia, and, when taken, were seeking to return to that watershed to spawn and die. It is therefore manifest that the catch in both the big and the lean years is the product of the same spawning-beds. The catches in the big years display the maximum product of the spawning-beds—the harvest that may be reaped four years after the beds have been abundantly seeded. The smaller catches in the lean years are the natural result of a failure to seed the same beds abundantly. Provided the beds had been as abundantly seeded in the lean years as they have been in the big years up to 1913, they would have produced as abundantly. Since the spawning-beds were abundantly seeded both in 1905 and 1909, the catch in those years represents the proportion of the total run that was in excess of the number necessary to stock all the beds.

Beyond any question the catch in 1913 was the product of the abundant spawning of 1909. Notwithstanding the fact that the catch of 1913 was very much greater than that of any former season, investigation demonstrated that a sufficient number of the fish escaped capture and passed up the Fraser River that year to have stocked all the beds as abundantly as they were stocked in 1909 *had they been permitted to reach them.* The catches of 1909 and 1913, great as they were, were not made at the expense of the capital stock, of the foundation of the run. The catches made in those years disclose the vast numbers that may be safely taken from every year's run when the beds are abundantly seeded.

The catches in recent lean years have grown less because they were made at the expense of the fish necessary to seed the beds. The catches in those years are in excess of the number that may be taken without endangering the supply of the stock fish. They have been an overdraft on the runs of the future. The runs can neither be maintained nor built up under such conditions. If for a period of lean years all the fish which return from the sea were permitted to reach the spawning-beds and there spawn, the runs in those years would eventually reach the proportion of a big year. It is simply a matter of conserving the brood stock, of seeding the spawning-beds.

The salmon industry does not depend upon the amount of money invested in canneries, gear, and boats. It depends upon the number of salmon which escape capture and successfully spawn. The perpetuation of the run depends upon the numbers which escape capture. The fish which are caught and canned are not factors in future runs. The fish that escape capture and reach the beds and spawn there are the stock-in-trade. The run four years hence depends upon their spawning. If the catch is not confined to that proportion of the total number of fish in the run that is in excess of the numbers necessary to seed the beds, it is made at the expense of the capital stock of the industry. If the catch is in excess of that number, it is made at the expense of the runs of the future. It is an overdraft. The catches in the lean years in the Fraser River District have long been made at the expense of the brood stock. A decline in

the catch of any year is a matter of passing moment if it can be shown that the number of fish which reached the spawning area was sufficient to seed the beds. A decline in the number which spawn is a much more serious thing, for it foretells future loss.

For the last decade and more the record of the pack of sockeye salmon in the Fraser River District and the reports from the spawning-beds of the watershed of that river leave no shadow of doubt as to the depletion of the runs in the lean years. It is difficult to see wherein more proof of depletion, save the final one of commercial extinction, could be adduced. The results of excessive fishing which were first manifested by the sparsely covered spawning-beds of the Fraser watershed are now more forcibly called to attention by the reduction in the size of the pack.

For the past fourteen years the reports of the British Columbia Fisheries Department have called attention to the conditions on the Fraser River spawning-beds which forecasted the depletion of the runs of the lean years. The report of that Department in 1913 forecasted the decline in the run of 1917. Year after year, since 1902, it has been shown that, with few exceptions, the greater proportion of the vast spawning-beds of the Fraser watershed have been but sparingly seeded in the lean years; that not enough fish reached those beds to maintain subsequent runs.

HISTORY OF THE FISHERY.

The history of the fishing in the Fraser River District in the past fourteen years is a record of depletion, a record of excessive fishing in the lean years, a record of failure on the part of the authorities of the State of Washington to realize the necessity of conserving a great fishery, notwithstanding convincing evidence submitted to them by agents of their own creation that disaster was impending to one of their great industries.

The Canadian authorities, on the other hand, have by their representations and acts evinced in unmistakable manner their willingness to deal squarely and adequately with conditions that foretold depletion, and to join with the State of Washington or the United States Government in legislation to prevent it.

Throughout the negotiations with the Canadian authorities and those of the State of Washington the former have urged the passage of restrictive measures for both Provincial and State waters. Following the investigation of 1905 of a joint commission representing the Dominion of Canada and the Governor of the State of Washington, the former approved the unanimous findings of that body, and passed, as recommended, an Order in Council which suspended all sockeye-fishing in the Canadian waters of the Fraser River District during the years 1906 and 1908, conditional upon the Legislature of the State of Washington passing an Act of like nature for her waters. The Legislature of the State refused to pass such an Act, whereupon the Dominion Order in Council was rescinded.

CANADA HAS DONE HER PART.

In 1908 Great Britain and the United States, "recognizing the desirability of uniform and effective measures for the protection, preservation, and propagation of food-fishes in waters contiguous to the Dominion of Canada and the United States," convoked a convention for that purpose, and appointed an international commission, consisting of one person named by each Government, to investigate conditions and prepare a system of uniform and common regulations for the protection and preservation of food-fishes. That commission agreed upon a uniform system for the protection, preservation, and propagation of the salmon in the Fraser River District. The Canadian Government promptly approved the finding and announced its willingness to adopt for her waters the regulations recommended. The Senate of the United States after years of delay refused approval, and the convention was terminated. Canada's record on this vital question is clear and unmistakable. She has been, and still is, desirous of maintaining and building up the runs of salmon to the Fraser. The record of the State of Washington in this respect is one of inaction. Unfortunately, Canada alone cannot preserve the fish. Until such time as the authorities of the United States or the State of Washington indicate by their enactments their willingness to meet the issue there is no relief in sight, and the runs to the Fraser River will continue to be decimated.

UNITED STATES SUFFERS.

The failure of the State of Washington to recognize the necessity for and the advantages that would follow the suspension of sockeye-fishing in the lean years in her own and the

Provincial waters of the Fraser River District is a reflection upon her business foresight. Her proportion of the catch of sockeye in each of the last three big years (1905, 1909, and 1913) has averaged 1,399,808 cases per year, of an average value of $11,198,464. Her average in each of the last six lean years has been 182,091 cases per year, of an average value of $1,456,728. The average value of her catch of sockeye in the big years up to 1917 exceeds the average value in the lean years by approximately $9,741,736 per year. Since, as has already been stated, the catches in both the big and the lean years are the product of the same spawning-beds, it is evident that those spawning-beds would have produced on the average as great a run in the lean years as they produced in the big years provided they had been as abundantly seeded. It is simply a question of seeding. The failure of the United States and the State of Washington to join Canada in measures to ensure seeding those beds every year as abundantly as in the big years has, in the three lean years of the last four-year cycle, entailed a loss to the State of Washington alone of $29,225,208. If the State of Washington would unite with the Dominion in the adoption of joint regulations that would ensure an abundance of fish reaching the spawning-beds every year—years in which there can be little profit to those engaged in the industry—there can be no question of the result. Provided fishing in the lean years is suspended for a sufficient period, the number of sockeye that reach the spawning-beds would approximate the number of former big years. The ultimate return from such a measure would be so great that it is difficult to understand the failure of those most concerned in the industry to secure the necessary legislation in the State of Washington.

Turning from a consideration of the runs in the lean years to that of the run in the big years, we find that the report of the Fisheries Department of British Columbia for 1913 affords the basis of an intelligent conception of the conditions on the spawning-grounds of the Fraser River, which in that year caused the decline in the catch in 1917. The reports from the spawning-grounds contained in the report for 1913 demonstrate that the numbers of sockeye salmon which passed up the Fraser River that year were as great as in any previous big year of which there is record, and possibly even greater. The capital stock of that year's run was not overdrawn even by the great catch of that season. In June the adult sockeye made their appearance in the canyon of the Fraser, above the town of Yale, and during the high water of June and July large numbers passed through for Quesnel and Chilko Lakes, at the head of the watershed. The greater proportion of the run of sockeye that reached the canyon at Yale in late July and during August and September were blockaded there by rock-obstructions placed in the channel incident to railway-construction, with the result that few of them were able to pass through the canyon during that time. The blasting of temporary passage-ways enabled a large proportion of the October and November sockeye run to pass through the canyon and spawn in Shuswap and Seton Lakes. In August sockeye were seen drifting down-stream between the canyon and Yale, which movement was very pronounced in September and continued until the middle of October. The streams which enter the Fraser between the canyon and Agassiz were filled with sockeye from the middle of August until the end of October, while they had not been observed in those streams in previous years. Very few sockeye spawned in any of these streams; most of them died without spawning. Vast numbers of dead sockeye, which had died without spawning, were found on the bars and banks of the Fraser between Yale and Agassiz in September and October.

The number of sockeye which reached Quesnel Lake in 1913 was little more than one-eighth of the number which entered that great lake in 1909. The number which entered Chilko Lake, the second largest lake in the watershed of the Fraser, was equally small. The summer run of sockeye to Shuswap, Adams, Seton, Anderson, and other large lakes in the Fraser watershed above the blockaded canyon was very much less than in any former big year, and the October and November run was also far less. The run in 1913 to Lillooet and Harrison Lakes, through the tributary which enters the Fraser below the blockaded canyon, was not greater than in former big years, showing that the blockaded salmon did not drop down-stream and spawn in these lakes. In summarizing conditions on the spawning-beds, the writer, in the Provincial Fisheries Report for 1913, said: "These facts, in my opinion, warrant the conclusion that the number of sockeye which spawned in the Fraser River watershed this year was not sufficient to make the run four years hence even approximate the runs of either 1905, 1909, or 1913."

OBSTRUCTION REMOVED.

It may here be noted that the rock-obstruction which prevented the late July and the August and September run of sockeye salmon from reaching suitable spawning-grounds in 1913 was all removed in 1914-15. In all, a total of 225,000 cubic feet of rock was removed at a cost of $120,000. The old channel of the river was fully restored. The salmon which reach there now have no greater difficulty in passing through the canyon than in years prior to 1913.

Had the slide of 1913 shut off the run of an off-year the damage would have been slight, because, as already shown, the number of fish which reach the spawning area in the off-years is small.

It was little less than a calamity that the rock-slide, which so nearly destroyed the run of 1913, should have occurred in a year of the big run. The destruction of the spawning run in the Fraser in 1913 is the greatest disaster that has been recorded in the history of the fishing industry of the world. So far as the writer is informed, it has had no parallel. Estimated on the valuation of the pack of that year, the loss to the fisheries of the Province of British Columbia in 1917 alone is in excess of $8,000,000 and the loss to the State of Washington is in excess of $19,500,000, a total loss to the packers of that district of $27,500,000.

Furthermore, the loss will not be confined to 1917. It will be repeated every fourth year, until such time as the Governments of Canada and the United States by united efforts, drastic and long continued, shall succeed in repopulating the spawning-beds of the Fraser River with the millions of adult sockeye that spawned there every fourth year up to 1913; for not only was the catch in 1917, 1,944,731 cases, or 81 per cent., less than in 1913, but in 1917 the spawning-beds were virtually unseeded. So great a proportion of the run that sought the Fraser watershed in 1917 was taken by the fishermen that the spawning-beds were no better seeded that year than in recent off-years. The result of the spawning cannot produce greater results in 1921 than were produced by the spawning of 1913, and there can be little hope that it will produce a result even approximately as great.

DRASTIC JOINT ACTION NEEDED.

Such statements should bring a realization of the extent of the remedial measures that must be adopted if the runs to the Fraser River are to be restored. How can the salmon be brought back? There have been, and there will continue to be, many suggestions as to how this may be accomplished, but all of them that fall short of closing the district to fishing for a long period of years—years including many four-year cycles—will fail to produce the equal of the runs of 1901, 1905, 1909, and 1913. This remedy cannot be applied by one Government. Neither Canada nor the United States alone can accomplish it. There must be joint action. The figures showing the catch in Canadian and United States waters of the district set forth in the opening paragraphs of this paper may be recalled to show the proportionate interest that each Government has in the salmon-fishery of the Fraser-bred fish.

Immediate joint action on the part of Canada and the United States looking to the restoration of the run of salmon to the Fraser River is imperative. The longer it is postponed the longer it will take. I venture the opinion that no other fishery question on this continent is of such importance. Certainly in no other fishery can so much be accomplished if an adequate close season is instituted and maintained.

DISCUSSION.

Dr. Robertson: Mr. Babcock has impressed on me, as a private citizen, the absolute necessity of regulating the catch in the Fraser River District. The fish did not get to their spawning-grounds. The magnitude of the disaster which has followed will, I think, make the Government realize the necessity of seeing that the fish get to their spawning-grounds. I take it that there is no limit to the spawning-places in the north; and the limit we put on our catch is the limitation on the number of fish that may reach the spawning-grounds, so that those grounds may be properly seeded.

Mr. Babcock is willing to answer questions, but before we ask any, Lieut.-Col. W. P. Anderson, Chief Engineer of the Department of Marine, might be able to supplement what Mr. Babcock has said.

Lieut.-Col. Anderson: I had not the slightest intention of speaking, although I happened to be in British Columbia in 1913, and was asked by the Department of Fisheries to look into the question of the landslide from an engineering point of view.

The slide came from a cliff on the south side of the Fraser River, and was caused by the Canadian Northern Railway building a tunnel. The tunnel took away the support from the face of the cliff and it came down in one mass, causing a water-fall of about 9 feet in the river where only a rapid had existed before. This happened at one of the narrowest parts of the river, and the water shot over the fall with such a velocity and in such a direction that the salmon could not jump it. Ordinarily, the height would not have stopped a salmon, but the velocity of the water was so great that they could not stem it. It was most interesting to watch the manœuvres of the salmon in trying to overcome that obstruction. They would coast along the shore of the river and take advantage of every little projecting point of rock or any little eddy that occurred, until they got right up to the point where no further protection was possible, and then they would make a jump for it, but would be caught by the current and inevitably carried down.

The Department was trying to help matters as much as possible by taking out the salmon in drift-nets, lifting them over the fall, and dumping them into the river above. In the aggregate, a great many salmon were thus transported into the upper waters, but apparently not enough to furnish sufficient eggs.

The immense mass of rock was later blasted into comparatively small pieces and removed to the shore above, thus making the current slow enough to allow the salmon to ascend the rapids.

I would like to ask Mr. Babcock if it would not be possible to arrange matters in such a way as to make the lean years a little more productive, thus making production more uniform.

Mr. Babcock: There is no doubt at all that if you could get as many fish on the spawning-beds in the lean years as in the big years you would get the same result. You could get the fish on the spawning-beds, but you could not do it and fish as now. I have been termed a pessimist respecting the lean years and the situation on the Fraser River, because our Department has been trying, in every known way, to prevent fishing in the lean years, in order that all the fish that came into the river in those years could reach the spawning-beds. There are millions of salmon on the spawning-beds of the Fraser River in a big year. Over 4,000,000 sockeye went into Quesnel Lake in 1909. This was ascertained by actual count of the fish as they passed through the fish-way at the outlet of the lake. I believe an equal number spawned in the Chilko Lake watershed; there were millions in Seton and Anderson Lakes, and over a million in Shuswap Lake. The greater portion of the Fraser watershed—the available spawning-grounds for sockeye—was absolutely crowded with fish in 1909. Notwithstanding that 25,000,000 were caught in that year, there was an equal number on the spawning-beds. In the Chilko River below Chilko Lake I saw fish as thick as I have ever seen them in a hatching-box in a hatchery. They were as thick as sheep in a corral into which you cannot get another sheep.

A member of the Commission: And how deep were they?

Mr. Babcock: I could not say. There were so many of them that the birds would not eat the eyes of those that were lying dead on the banks. They had eaten so many they were glutted. That indicates the supply of fish on the spawning-beds.

In the lean years the situation is very different. In 1916, in Quesnel Lake, we could not get fish enough to obtain measurements and scales. *We did not catch one female salmon there in 1916.*

In 1917 approximately only 27,000 sockeye went into Quesnel Lake, as against 4,000,000 in 1909 and 500,000 in 1913. Catches in the Fraser River District have been lean because there were no fish on the spawning-beds in the fourth preceding year. Canada, as I have tried to impress on you, has endeavoured to stop fishing. The officials sent over from the State of Washington to investigate agreed with us, but the State took no action. The Dominion Government passed an Order in Council closing all Fraser River fishing in 1906 and 1908, provided the State of Washington would do the same thing. The State Senate passed such a regulation unanimously, but the Assembly threw it out.

Senator Edwards: If, in these years, there were the normal numbers of fish spawning, why are not all subsequent years prolific?

Mr. Babcock: Because there are not enough fish running in the lean years, and very few escape the fishermen. If you compare a year when the pack is 186,000 cases with a year in which it is 2,000,000 cases, you can see the enormous difference in the number of fish that were running in those years.

Mr. Snowball: Why?

Mr. Babcock: They live four years? The run of a given year depends on the number that spawned four years before.

Mr. Snowball: The fish that were hatched in 1905 come back in 1909?

Mr. Babcock: Yes.

Mr. Snowball: Why the small run in 1904?

Mr. Babcock: The catch in 1904 was small because the run in 1900 was small and the beds were unseeded. There have always been three lean years followed by one big one. There has been much speculation as to the reason for this. It may be due to a slide centuries ago similar to the one in 1913.

Mr. Snowball: But it would have to come three years in succession.

Mr. Babcock: No. If we had not taken the slide of 1913 out, it probably would have been there yet and the fish could not have got by. Many years ago something may have shut off access to the spawning-grounds and made those years barren at a time of which we have no record.

Mr. Hewitt: That would postulate the removal of that obstacle every fourth year.

Mr. Babcock: Yes.

Mr. Snowball: Would the prohibition of fishing in 1921 produce a normal run again?

Mr. Babcock: No. If we had had no fishing this year, and if all the fish that came into the river had been permitted to get on to the spawning-beds and spawn, there would still not have been as many fish on the spawning-beds as there were in 1913.

Dr. Robertson: Would two full periods of four years each, in which no fishing was allowed, rectify the situation?

Mr. Babcock: I do not believe that even two four-year periods will be sufficient. To bring the spawning up to the spawning of a big year's run, I believe fishing will have to be prohibited for many four-year cycles. Up to 1913 some men who studied the question said that there were too many salmon on the spawning-ground in the big years.

Dr. Hewitt: It looks as if the phonomenon of the big year had been wiped out and that future years will be uniform.

Dr. Jones: Have you any data as to the number of fish reaching the spawning-beds this year compared with the lean years?

Mr. Babcock: The number was little larger than in the lean years.

Dr. Jones: It seems to me that the preparations for catching this year, although the catch was not excessive, might have prevented many more going up than even in the last year.

Mr. Babcock: They went after them in every way they could. At times, in 1901, the canners refused to take the entire catch, and many thousands were thrown away. The price of sockeyes was about 10 cents each. It was 50 cents early this year, and 75 cents after they saw the effect of the slide. The pinks, which run every second year, live only two years and die. We would not use them in 1901. When the Provincial Government began to propagate them in 1903, it was ridiculed for doing it. The packers said they were a nuisance. They did not use them all in 1909. They used a good many in 1913. They paid 3 cents each in 1913, 15 cents in 1915, and 32 cents this year.

Dr. Jones: Did the slide affect them in the same way?

Mr. Babcock: Yes. It affected all that should have spawned above the canyon.

Dr. Robertson: Do you know if there is any difference in the success with which the fish reach the upper regions in the early part of the season and the late part of the season?

Mr. Babcock: Not ordinarily. Prior to 1913 the fish never failed to get through.

Lieut.-Col. Anderson: If you saw the aggregation of drift-nets in the Fraser River, you would wonder how any got through. There are twenty or thirty miles of nets.

Mr. Babcock: This year, in this water alone (indicating Gulf of Georgia and Fraser River), there were 2,600 gill-nets fishing as hard as they could, and there was not an available point in that district (indicating Puget Sound) in which they could drive a trap or use a purse-seine that they were not doing so. They are now trying to use gill-nets in the clear waters there.

The Americans catch 66 per cent. to our 34 per cent., because they have the first chance at the fish and in their waters they use traps. If we had control of the whole situation we could soon effect a change.

Mr. Found: I wish to say a word of appreciation of Mr. Babcock's paper. The problem, as he has pointed out, is an international one. Canada alone cannot save the situation. None of us who have been following the matter closely would be any more ready to hazard a statement as to just what length of time it will take to rehabilitate the fishery than was Mr. Babcock; but there is no question that by international co-operation it can be done. It is fortunate that we now have the United States as our ally, for it makes it easier for us to take a common view-point. The matter has already been taken up, and we hope it will be found possible, by international co-operation, even though drastic action will be necessary, to restore the fishery to its former condition. The gravity of the situation has been realized for years by every one in Canada who has been dealing with it.

Any one seeing the immense amount of fishing-gear in United States waters would wonder that our own fishermen have any fish to catch at all when their turn comes. Canada has only second chance at the fish, and could, if she so desired, have followed the course the Americans have in fishing to depletion, but she has not done so, and the fishery has thus been spared.

I would not want the impression to be gained that no protection has been given. Not only has the length of net and the size of the mesh been limited, but each week a close time from twenty-four to forty-eight hours has been enforced, during which no nets were allowed in the water. Had fishing gone on all week in our waters, conditions would have been worse than they are.

Mr. Snowball: Do the same number of people fish in the lean years as in the full years?

Mr. Babcock: Since the war the demand has become so great that there was about as much gear in the water in 1916 as in 1917. The years 1916 and 1917 presented a great opportunity for fishermen, because the fish brought 50 cents each.

If the spawning-beds are well seeded, you can confidently expect that you may have a run four years thence. It does not necessarily follow that you will, because, for three years, when the fish are out in the ocean, you do not know what happens to them. There may be epidemics among them, or their enemies may be more successful in attacking them. You can seed the beds well and have a failure; but if you do not seed the beds you cannot have a run.

There never has been an instance in which the spawning has been poor that there has been a good run four years later. That cannot be. But you may send millions of young fish down the Fraser River from the spawning-beds, and then have some disaster overtake them in the sea. But if you do not send any down from the beds you cannot possibly have them hatched in the sea, because they cannot possibly be hatched in salt water.

Mr. Snowball: Have you any artificial hatcheries?

Mr. Babcock: Lots of them, but this year we have no eggs with which to fill them.

PACK OF BRITISH COLUMBIA SALMON, SEASON 1917.

COMPILED FROM FIGURES FURNISHED THE DEPARTMENT BY THE B.C. SALMON CANNERS' ASSOCIATION.

Names.	Sockeyes.	Red Springs.	White Springs.	Chums.	Pinks.	Cohoes.	Bluebacks and Steelheads	Grand Totals (Cases).
FRASER RIVER DISTRICT—								
B.C. Packers' Association	40,578	1,438	3,967	856	42,226	5,018	43	94,126
Anglo B.C. Packing Co., Ltd.	7,119	239	561	....	10,554	657	....	19,130
J. H. Todd & Sons	6,297	230	600	3,707	5,500	1,320	....	17,654
J. H. Todd & Sons (Esquimalt)	24,350	....	....	....	....	....	....	24,550
B.C. Canning Co., Ltd.	14,241	3,666	1,834	1,053	8,679	1,842	21	31,336
Glen Rose Canning Co., Ltd.	5,007	68	58	478	3,144	510	....	9,265
Great West Packing Co., Ltd.	3,073	108	587	1,349	5,715	2,247	....	13,079
M. DesBrisay & Co	3,887	434	1,827	25	3,228	627	....	10,028
Gosse-Millerd Packing Co., Ltd.	11,797	1,369	2,455	16,923	12,814	3,511	31	48,900
Steveston Canning Co., Ltd.	1,426	74	305	....	2,168	108	....	4,081
Defiance Packing Co., Ltd.	4,068	1,396	3,021	11,901	5,176	805	3,011	29,378
C.L. Packing Co., Ltd.	5,321	135	640	4,188	5,317	582	....	16,183
St. Mungo Canning Co., Ltd.	5,885	225	927	4,022	4,101	4,139	....	19,299
Eagle Harbour Packing Co., Ltd.	2,465	92	191	7,654	4,699	1,354	1,836	18,291
Liverpool Canning Co., Ltd.	3,976	252	1,469	7,198	5,002	1,607	9	19,513
Booth Fisheries Co., Ltd.	5,806	471	414	619	11,055	1,378	....	19,743
Kildala Packing Co., Ltd.	2,668	....	60	....	5,064	190	....	7,982
Totals	148,164	10,197	18,916	59,973	134,442	25,895	4,951	402,538
SKEENA RIVER DISTRICT—								
B.C. Packers' Association	15,056	2,831	200	2,365	43,249	10,583	1,191	75,475
Anglo B.C. Packing Co., Ltd.	8,040	1,567	762	717	20,540	3,183	....	34,809
J. H. Todd & Sons	4,159	2,510	633	659	11,001	9,388	....	28,350
Kildare Packing Co., Ltd.	6,472	459	48	572	9,317	1,509	244	18,621
B.C. Canning Co., Ltd.	7,425	1,095	209	250	9,523	3,753	167	22,422
Skeena River Com. Co., Ltd.	4,070	681	438	13,483	9,311	2,632	209	30,824
Cassiar Packing Co., Ltd.	4,954	831	52	237	11,016	1,518	....	18,608
Wallace Fisheries, Ltd.	9,179	1,551	....	366	15,816	2,416	....	29,328
Gosse-Millerd Packing Co., Ltd.	3,195	1,289	216	2,822	10,526	2,939	37	21,024
Canadian Fish & Cold Stor. Co., Ltd.	3,210	772	141	45	8,020	535	35	12,758
Totals	65,760	13,586	2,699	21,516	148,319	38,456	1,883	292,219
RIVERS INLET DISTRICT—								
B.C. Packers' Association	20,175	301	37	6,566	3,736	3,479	....	34,294
Anglo B.C. Packing Co., Ltd.	6,988	107	....	88	328	101	....	7,612
J. H. Todd & Sons	7,946	....	....	2,388	681	2,085	....	13,100
B.C. Canning Co., Ltd.	7,864	152	....	11	77	53	....	8,157
Kildala Packing Co., Ltd.	6,635	110	31	2,005	2,090	2,538	....	13,409
Wallace Fisheries, Ltd.	7,885	45	34	4,907	647	209	....	13,727
Provincial Canning Co., Ltd.	3,702	....	....	136	506	659	....	5,003
Totals	61,195	715	102	16,101	8,065	9,124	....	95,302
NASS RIVER DISTRICT—								
B.C. Packers' Association	4,950	1,706	233	1,704	5,318	3,973	359	18,243
Anglo B.C. Packing Co., Ltd.	8,528	376	732	8,295	15,839	4,843	364	38,977
Kincolith Fisheries, Ltd.	5,523	876	361	8,894	9,887	6,864	269	32,674
M. DesBrisay & Co	3,187	212	....	6,045	13,524	6,500	133	29,601
Totals	22,188	3,170	1,326	24,938	44,568	22,180	1,125	119,495
VANCOUVER ISLAND DISTRICT—								
Anglo B.C. Packing Co., Ltd.	94	14	....	17,418	4,491	4,831	....	26,848
J. H. Todd & Sons	....	3,758	900	140	16,800	6,013	....	27,611
Wallace Fisheries, Ltd.	1,092	5,466	274	46,499	18	2,856	....	56,205
Quathiaski Canning Co., Ltd.	2,435	229	187	10,283	8,032	5,133	....	26,299
Western Packers, Ltd.	153	265	192	693	1,698	2,718	....	5,719
C.L. Packing Co., Ltd.	41	....	....	15,936	4,225	634	....	20,836
Preston Packing Co., Ltd.	....	961	387	5,563	1,276	2,125	....	10,312
Clayoquot Sound Canning Co., Ltd.	1,800	700	....	3,800	....	325	....	6,625
Nanaimo Canning & Packing, Ltd.	1,203	312	191	28,139	3,359	2,522	....	35,726
Redonda Canning & Cold Storage Co.	....	332	476	9,377	2,143	....	1,753	14,081
Gulf Islands Fishing & Can. Co., Ltd.	176	236	235	14,616	1,714	1,007	1,163	19,147
Sidney Canning Co., Ltd.	2,437	417	429	4,794	5,400	2,402	....	15,879
Lummi Bay Packing Co.	196	....	....	50,902	....	154	....	51,252
Nootka Packing Co., Ltd.	12	3,024	524	32,221	....	1,013	....	36,794
Totals	9,639	15,714	3,795	240,381	49,156	31,733	2,916	353,334
OUTLYING DISTRICTS—								
B.C. Packers' Association	9,634	2,222	593	18,796	17,489	10,885	143	59,762
Gosse-Millerd Packing Co., Ltd.	669	145	....	23,872	22,627	1,897	....	49,210
Kildala Packing Co., Ltd.	1,783	108	....	7,567	6,681	2,147	245	18,531
Wallace Fisheries, Ltd.	5,383	399	....	8,068	311	458	....	14,619
Draney Fisheries, Ltd.	9,615	420	99	27,268	30,184	8,078	477	76,141
Western Packers, Ltd.	5,818	4	....	1,784	27,606	2,317	....	37,529
Aliforce Bay Cannery	....	1,950	116	19,853	1,166	591	....	23,676
Tallheo Fish, Ltd.	....	....	....	5,156	6,145	3,828	....	15,129
Totals	22,902	5,248	808	112,364	112,209	30,201	865	294,597
Grand totals	339,848	48,630	27,646	475,273	496,759	157,589	11,740	1,557,485

STATEMENTS SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1902 TO 1917, INCLUSIVE.

Fraser River.

	1917.	1916.	1915.	1914.	1913.	1912.	1911.	1910.	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.
Sockeyes	148,164	32,146	91,130	198,183	719,796	123,879	58,487	150,432	585,435	74,574	59,815	183,007	857,489	72,688	204,809	293,477
Springs, Red	10,197	17,673	23,228	11,209	3,573	15,856	7,028	1,018	1,428	1,903	3,448	7,523	5,507	9,482	2,084	33,618
Springs, White	18,916	11,430	5,392	15,300	49	9,826	6,751	8,925	....	2,263	557	....	....	....	....	....
Chums	59,973	30,934	18,919	74,826	22,220	12,997	47,287	52,460	8,687	415	63,530	15,543	3,204	1,066	4,504	....
Pinks	134,442	840	138,305	6,272	20,773	574	142,101	128	....	....	....	....	....	....	....	....
Cohoes	25,895	31,330	43,514	43,504	16,018	36,190	39,740	35,031	27,919	33,270	35,766	34,413	30,836	45,667	25,728	....
Steelheads	4,951	3,129	31	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	402,538	127,472	320,519	349,294	782,429	199,322	301,344	247,994	623,469	112,425	163,116	240,486	877,136	128,903	237,125	327,095

Skeena River.

Sockeyes	65,760	60,293	116,533	136,166	52,927	92,498	131,066	187,246	87,961	139,846	108,413	86,384	84,717	93,401	50,968	117,677
Springs	16,285	20,933	15,273	11,740	26,436	23,833	17,942	9,785	12,469	13,842	10,378	20,138	14,598	20,621	18,008	37,198
Chums	21,516	17,121	5,769	8,329	....	504	70	....	....	....	....	....	....	....	....	....
Pinks	148,319	73,029	107,578	71,021	66,045	97,588	81,956	13,473	28,120	45,404	25,217	38,991	7,523	30,529	20,045	....
Cohoes	38,456	47,409	32,190	16,378	18,647	39,835	23,376	11,531	12,249	10,085	15,247	16,897	7,247	10,315	9,648	....
Steelheads	1,883	3,743	1,798	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	292,219	223,158	279,161	237,634	164,055	254,258	254,410	222,035	140,739	209,177	159,255	162,420	114,085	154,869	98,669	154,875

Rivers Inlet.

Sockeyes	61,195	44,936	103,350	89,890	61,745	112,884	88,763	126,921	89,027	64,652	87,874	122,631	82,771	93,862	68,119	68,819
Springs	817	1,422	1,022	566	594	1,149	317	383	587	451	450	181	351	11	872	1,479
Chums	16,101	20,144	5,387	5,023	....	3,845	288	....	....	....	....	....	....	....	....	....
Pinks	8,065	3,567	2,964	5,784	2,097	8,809	5,411	19	....	479	700	....	....	61	180	....
Cohoes	9,124	15,314	7,115	7,789	3,660	11,010	6,287	2,075	1,400	9,505	5,040	66	....	358	219	....
Steelheads	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	95,302	85,383	146,838	109,052	68,096	137,697	101,066	129,398	91,014	75,090	94,064	122,878	83,122	94,292	69,390	70,298

Nass River.

Sockeyes	22,188	31,411	39,349	31,327	23,574	36,037	37,327	30,810	28,246	27,584	17,813	22,166	24,462	15,000	8,438	20,953
Springs	4,496	3,845	3,701	3,385	3,151	6,936	3,759	1,239	2,337	3,263	1,288	921	3,340	2,357	1,475	2,265
Chums	24,938	11,200	11,076	25,769	2,987	3,245	5,189	351	3,789	....	....	....	....	....	....	....
Pinks	44,568	59,593	34,879	25,333	20,539	12,476	11,467	895	....	6,612	5,957	3,450	1,840	31	....	....
Cohoes	22,180	19,139	15,171	9,276	3,172	12,468	7,942	6,285	6,818	8,348	6,093	5,997	3,083	1,697	2,187	....
Steelheads	1,125	1,498	113	....	....	....	....	140	....	1,101	681	....	....	....	....	....
Totals	119,495	126,686	104,289	94,890	53,423	71,162	65,684	39,720	40,990	46,908	31,832	32,534	32,725	19,085	12,000	23,218

VANCOUVER ISLAND DISTRICTS.*

	1917.
Sockeyes	9,639
Springs	19,509
Chums	240,381
Pinks	49,156
Cohoes	31,733
Total	325,723

OUTLYING DISTRICTS.

	1917.	1916.	1915.	1914.	1913.	1912.	1911.	1910.	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.
Sockeyes	32,902	45,373	98,660	87,130	149,336	79,464	67,866	70,506	49,832	48,367	40,159	45,481	51,234	48,272	36,383	30,510
Springs	6,056	11,423	9,488	7,108	7,246	22,837	12,059	7,439	2,196	6,439	9,977	3,581	4,563	2,950	3,218	19,986
Chums	112,364	160,812	40,849	70,727	52,758	37,734	39,167	5,551	....	....	....	....	....	....	....	....
Pinks	112,209	143,615	83,626	111,930	83,430	128,296	64,312	20,098	6,148	23,538	23,300	7,964	1,303	4,409	2,653	....
Cohoes	30,201	70,431	48,966	43,254	28,328	65,806	42,457	19,460	13,532	20,709	25,754	11,759	3,292	13,114	14,136	....
Steelheads	865	712	985	....	....	....	....	....	....	36	2	....	....	....	....	....
Totals	294,597	432,366	313,894	320,168	285,898	334,187	226,461	123,054	71,708	99,089	99,192	68,785	60,392	68,745	56,390	50,496

PACKED BY DISTRICTS IN PREVIOUS YEARS.

	1917.	1916.	1915.	1914.	1913.	1912.	1911.	1910.	1909.	1908.	1907.	1906.	1905.	1904.	1903.	1902.	Total for Districts.
Fraser	402,538	127,472	320,519	349,294	782,429	199,322	301,344	247,994	623,469	112,425	163,116	240,486	877,136	128,903	237,125	327,095	5,038,129
Skeena	292,219	223,158	279,161	237,634	164,055	254,258	254,410	222,035	140,739	209,177	159,255	162,420	114,085	154,869	98,669	154,875	2,828,800
Rivers Inlet	95,302	85,383	146,838	109,052	68,096	137,697	101,066	129,398	91,014	75,090	94,064	122,878	83,122	94,292	69,390	70,298	1,477,678
Nass River	119,495	126,686	104,289	94,890	53,423	71,162	65,684	39,720	40,990	46,908	31,832	32,534	32,725	19,085	12,000	23,218	795,146
*Vancouver Island	325,723	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	325,723
Outlying Districts	294,597	432,366	313,894	320,169	285,898	334,187	226,461	123,054	71,708	99,089	99,192	68,785	60,392	68,745	56,390	50,496	2,610,826
Grand totals	1,557,485	995,065	1,164,701	1,111,039	1,353,901	996,626	948,965	762,201	967,920	542,689	547,459	627,103	1,167,460	465,894	473,574	625,982	12,750,579

* Previously the Vancouver Island pack was shown in Outlying Districts pack.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

REPORT

Of the Minister of Justice upon the Statutes of the Legislative Assembly of the Province of British Columbia passed during the Session of 1917.

By Command.

J. D. MacLEAN,
Provincial Secretary.

Provincial Secretary's Office,
August 12th, 1918.

At Government House,
Victoria, B.C., 12th June, 1918.

Sir,—I have the honour to transmit to you herewith a report of the Minister of Justice, dated the 21st May, 1918, duly approved by His Excellency the Governor-General on the 30th May last, respecting the Acts passed by the Legislature of British Columbia in the year 1917, 7 & 8 Geo. V., which are left to such operation as they may have, with the exception of chapter 67, entitled "An Act to validate certain Sales of Land for Arrears of Taxes," and chapter 71, entitled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" which are reserved for separate reports.

I have also the honour to enclose herewith a report of the Minister of Justice, dated the 21st May last, approved by His Excellency the Governor-General on the 30th May last, recommending the disallowance of chapter 71 of 7 & 8 Geo. V. (1917), assented to on the 19th day of May, 1917, and received by the Secretary of State on the 31st day of May, 1917, entitled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" together with the Order of His Excellency the Governor-General declaring the disallowance of the said Act, to which is attached the certificate of His Excellency the Governor-General as to the receipt of the said Act in the Department of the Secretary of State.

I also have the honour to enclose a report from the Minister of Justice, dated 27th May last, duly approved by His Excellency the Governor-General on the 30th May last, respecting an Act to validate certain sales of land for arrears of taxes, passed in the seventh and eighth years of His Majesty's reign, 1917, and received by the Secretary of State of Canada on the 30th day of May, 1917, and a petition from John Heron *et al.*, praying for the disallowance of the said Act, which, for the reason stated in the said report of the Minister of Justice, is left to such operation as it may have.

I have the honour to be,
Sir,
Your obedient servant,

F. S. BARNARD,
Lieutenant-Governor.

The Honourable the Provincial Secretary.

Certified Copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor-General on the 30th May, 1918.

The Committee of the Privy Council have had under consideration the annexed report from the Minister of Justice, dated 27th May, 1918, upon chapter 67 of the Statutes of British Columbia, intituled "An Act to validate certain Sales of Land for Arrears of Taxes," passed in the 7th and 8th year of His Majesty's reign (1917) and received by the Secretary of State of Canada on the 31st day of May, 1917, and a petition from John Heron *et al.*, praying for the disallowance of the said Statute.

The Minister, for the reasons stated in the said report, recommends that the said Statute be left to such operation as it may have.

The Committee concur in the report and recommendation of the Minister of Justice, and advise that a copy hereof and of the accompanying report, if approved, be transmitted to the Lieutenant-Governor of British Columbia for the information of his Government; also that a copy be transmitted to the petitioners' solicitor.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU.
Clerk of the Privy Council.

His Honour the Lieutenant-Governor of British Columbia.

DEPARTMENT OF JUSTICE,
OTTAWA, 27th May 1918.

To His Excellency the Governor-General in Council:

The undersigned has had under consideration chapter 67 of the Statutes of British Columbia, passed in the 7th and 8th year of His Majesty's reign (1917) and received by the Secretary of State for Canada on 31st May last, intituled "An Act to validate certain Sales of Land for Arrears of Taxes." It is recited by this Act that certain lands were sold for arrears of taxes under the "Taxation Act," the conveyances of which were executed or delivered before the expiry of two years from the day of sale; also that the former Assessment District of New Westminster was in 1895 divided into two assessment districts—viz., the District of Vancouver County and the District of Westminster County—and that conveyances of certain lands situate in the former Assessment District of New Westminster which by the division aforesaid were comprised in the Assessment District of Vancouver County, but were sold for arrears of taxes before the date of the division, were executed by the Assessor of the Assessment District of Westminster County, and that in like manner some conveyances belonging by the division to the Vancouver District were executed by the Assessor of the Westminster District; that doubts have arisen as to the validity of these sales and conveyances, and that it is expedient to validate them. Upon this narrative the Act proceeds to make the conveyances effective notwithstanding that they were made before the expiry of the statutory period or by the wrong Assessor. Provisions are introduced, however, for redemption of the lands sold by paying to the Collector, for the benefit of the purchaser, the purchase price and fair value of improvements, with interest at 12 per cent., or, if the lands be no longer held by the purchaser, that they may be redeemed within sixty days from the passing of the Act by paying to the Collector, for the benefit of the holder of the lands, the amount of the purchase price, the taxes paid by the holder, and the fair value of his improvements, with interest at the rate aforesaid, and there is provision for arbitration of the value of the improvements in case of difference, and further provisions for the necessary procedure.

A petition for the disallowance of this Act, dated 30th April last, was presented to Your Excellency in Council by John Heron, Hugh Heron, and Charlotte Coleman, and copy of this petition, referred for the consideration of the undersigned, was received at the Department of Justice on 10th instant. Copy of the petition is submitted herewith, and it states in effect that the petitioners were interesed in Lots 299, 300, and 301 of Group 1, New Westminster, now Vancouver District, as residuary legatees of Robert Heron, who owned the said lots, and who died about 13th June, 1904. The petitioners proceed to allege that "on the 22nd July, 1896, one E. L. Kirkland, an alleged Assessor of the District of New Westminster, unlawfully and wrongfully, and without the knowledge or consent of the said Robert Heron or of your petitioners, purported to sell the said lands for taxes, and on the 22nd July, 1898, purported to execute a deed of the same to the alleged purchaser, and on the 9th December, 1903, one W. L. Fagan, an alleged Assessor of the District of Vancouver, unlawfully and wrongfully, and without the knowledge or consent of the said Robert Heron or of your petitioners, purported to sell the lands for taxes, and on the 23rd February, 1906, purported to execute a deed of the same to an alleged assignee of the alleged purchaser.

"The first-mentioned tax deed bears date one day before the expiry of two years from the date of the tax sale—the Statute allows the deed to be made only after that period has elapsed—and the person who executed it was not the Assessor for the County of Vancouver, in which the land was situated, but the Assessor for the County of Westminster, who had no authority or jurisdiction whatever in the matter.

"As to the secondly mentioned tax sale, one of the executors of the will of the said Robert Heron, on the 12th October, 1904, made lawful tender to the said W. L. Fagan; but the said Fagan refused to permit the lands to be redeemed, unless under the title supposed to have been acquired by virtue of the first sale.

"At the request of your petitioners the said executors did, by deed under seal dated 31st July, 1913, grant and convey the said lots to your petitioners."

It appears, moreover, that the petitioners brought an action in the Supreme Court of British Columbia on 30th September, 1913, claiming a declaration of title, and that the conveyances were void; that they failed in this action at the trial and upon appeal to the Court of Appeal for British Columbia, but that on appeal to the supreme Court of Canada it was decided, reversing the judgments below, that the sales and conveyances in question were null and void, and that the deeds should be struck off the registry. The property in question is said to be worth $15,000, and the petitioners claim "that the said Act (*a*) is unjust and contrary to sound principles of legislation; (*b*) confiscates private vested rights without providing for compensation, and is, therefore, an irreparable injustice; and (*c*) unduly interferes with private rights and property which has been held by the highest Court of last resort in the Dominion to belong to your petitioners."

When the petition came to be considered in due course in the Department, the Deputy Minister of Justice on 20th instant telegraphed the Attorney-General of British Columbia, as the time limited was not adequate for correspondence through the usual channels, as follows:—

"John Heron, Hugh Heron, and Charlotte Coleman present petition for disallowance of 'Tax-sale Validation Act,' chapter sixty-seven of nineteen seventeen, upon ground that petitioners' title to Lots Two hundred and ninety-nine, Three hundred, and Three hundred and one, Group One, New Westminster District, established in litigation by judgment of Supreme Court of Canada of twenty-fourth June, nineteen sixteen, declaring tax sale and deed to British Columbia Land and Investment Agency null and void. Petitioners allege these lots worth fifteen thousand dollars and that Act in question operates to reverse judgment of Supreme Court and confiscate petitioners' property. Please telegraph for information of Minister of Justice any observations which your Government desires Minister to consider in reporting upon petitioners' application. Time for disallowance expiring."

On 24th instant the Deputy Minister, having received no reply, again telegraphed the Attorney-General, as follows:—

"Reply to my telegram twentieth instant *re* 'Tax-sale Validation Act,' urgently required, and in this connection please state whether your Government would undertake to promote amendment at next session providing that rights adjudicated or in pending cases shall not be prejudiced or affected by the provisions of this Act; and afterwards on the same day the Deputy Minister received a reply from the Attorney-General to his first message, dated 23rd instant, reading as follows:—

"Replying your telegram twentieth, we consider 'Tax-sale Validation Act,' chapter sixty-seven of nineteen seventeen, fully justified under existing circumstances. Legislature considered matter fully and came to conclusion that the Heron suit, as well as several other suits then pending, possessed no real merit, as these suits placed in jeopardy titles of *bona-fide* purchasers, who had been in possession for years after having purchased at tax sale. There seemed to be no good reason for placing cases in litigation on a higher place than others. The circumstances were peculiar. Purchasers at a tax sale held years ago in the former Assessment District of New Westminster had tax deeds given to them one day too soon; in addition, they were executed by the wrong Assessor owing to a division of the district in 1895 to New Westminster County and Vancouver County. In the case of Heron *vs.* Lalonde, the heirs of the original owners, who allowed taxes to accumulate, with the result that their lands were sold for taxes to *bona-fide* purchasers, asked for a declaration that the tax-sale deed was a nullity and that they should be declared the true owners on the technical grounds referred to, notwithstanding that in the meantime the purchasers were in occupation for years, the land greatly improved

in value, or possibly changed hands several times. The only ground for urging that this legislation should not affect the case of Heron *vs.* Lalonde would be that the Legislature should have a higher regard for the law costs which the plaintiffs incurred in the litigation than for the undoubted rights of the purchasers. They, doubtless, incurred some costs, but they were incurred in an effort to deprive *bona-fide* purchasers of their just rights, and their diligence in that respect should not be regarded. Further, as a matter of fact, the case of Heron *vs.* Lalonde was not concluded, as it might still go to the Privy Council, and I understand that was the intention of the defendants. We did, however, provide by this Act that the original owners might redeem by paying for the use of the purchasers the purchasers' price, taxes, and the value of improvements, the same to be fixed by arbitration, giving them sixty days to do so, a period quite long enough to give parties who had no moral or equitable claim to the property. The situation was intolerable, and, as stated, hundreds of other cases were in a similar position; we did not discriminate between titles in litigation and titles in which litigation was not pending. Why should those who started unmeritorious litigation be placed in a better position than others, or be allowed to get away with the fruits of litigation based on the technicalities referred to? If the Act were not passed, not only would many titles be imperilled, but it would have affected loan securities, and investments as well. Further, these titles given to *bona-fide* purchasers were Government titles and not municipal titles. They are signed by the Government Assessor as an official deed of the Crown in the right of the Province. It was incumbent on the Crown to protect its titles doubly, so when the mischief was caused by the Government's division of the assessment district and the Act of its own Assessor in signing the deed a day too soon. It is submitted that there is ample precedent for allowing Provincial legislation overriding judgment of the Court to stand, and that following the practice laid down in the past by your Department, legislation within the competence of Provincial Legislature should not be disallowed on ground of alleged hardship."

Although the undersigned does not find himself in agreement with all these observations of the Attorney-General, it is true that the situation which the Attorney-General describes was a proper one for legislative action. Titles have been transferred for arrears of taxes in intended execution of statutory powers, and presumably the proceeds of these sales have been appropriated or distributed conformably to statutory requirements. There seems to have been considerable difference of judical opinion, but in the result the conveyances have been declared invalid for defective procedure. It is not suggested that the taxes were not justly due; that the lands were not chargeable, or that they would have been redeemed previously to sale if the sales had taken place at the time, or if the conveyances had been executed by the officer authorized by Statute. The judgment of the Supreme Court directed that there should be no costs to either party in that Court or in the Courts below, and the Statute contains a provision, such as it is, enabling the former proprietors to redeem their lands upon compliance with the conditions prescribed by the Statute. In these circumstances, the undersigned is of opinion that Your Excellency in Council would not be justified to interfere with the operation of the Validating Act, merely because of the absence of provisions which would have commended themselves to Your Excellency in Council for the better protection of litigants in pending cases, or of those who had already succeeded to have their claims judicially established.

The undersigned recommends, therefore, that the Statute be left to such operation as it may have, and that a copy of this report, if approved, be transmitted to the Lieutenant-Governor of British Columbia for the information of his Government; also that a copy be transmitted to the petitioners' solicitor.

Humbly submitted.

(Signed.) CHARLES J. DOHERTY.
Minister of Justice.

Certified Copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor-General on the 30th May, 1918.

The Committee of the Privy Council have had under consideration the annexed report of the Minister of Justice, dated 21st May, 1918, upon the Statutes of the Legislature of British Columbia passed in the year 1917, 7 & 8 Geo. V.

The Committee concur in the views of the Minister of Justice as set out in the said report, and, on his recommendation, advise that a copy hereof and of the accompanying report, if approved, be transmitted to the Lieutenant-Governor of British Columbia for the information of his Government.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU.
Clerk of the Privy Council.

His Honour the Lieutenant-Governor of British Columbia.

Department of Justice,
Ottawa, May 21st, 1918.

To His Excellency the Governor-General in Council:

The undersigned has had under consideration the Statutes of the Legislature of British Columbia passed in the year 1917, 7 & 8 Geo. V., and he is of opinion that these Statutes may be left to such operation as they may have, with the exception of chapter 67, entitled "An Act to validate certain Sales of Land for Arrears of Taxes," and chapter 71, entitled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" which are reserved for separate reports.

As to chapter 76, entitled "An Act to amend the 'Vancouver Incorporation Act, 1900,'" the undersigned has had under consideration a complaint submitted to the Prime Minister by Messrs. Geo. D. Atkin & Co., of London, enclosing copy of a circular letter of 14th July last, addressed by the Secretary of British Columbia Electric Railway Company, Ltd., on behalf of the directors, to the shareholders of the company, explaining to the shareholders that by virtue of the legislation in question the City of Vancouver will be permitted to compete in the supply of electric light and power after 1st June, 1919. It would appear that the city had applied to the Legislature in 1900 for reconsideration of its Act of Incorporation with a view to obtain, among other objects, the repeal of a provision prohibiting competition with the company except upon condition of willingness to treat for the acquisition of the company's franchise. This application was opposed on behalf of the company, and in the result a compromise was reached, satisfactory at the time to both parties, whereby legislation was enacted which contains certain limitations against competition. These limitations have now been withdrawn by the legislation in question, and it is upon that account that Messrs. Atkin & Co. protest against the legislation as affecting investors.

Upon consideration of the correspondence submitted, the undersigned concludes that the rights of the company, depending merely upon antecedent legislation, were such as the Legislature might change in the execution of its constitutional powers, and that Your Excellency in Council is not required to justify or to become responsible for the policy of the legislation in declining to exercise the power of disallowance upon the grounds suggested.

The undersigned recommends that a copy of this report, if approved, be transmitted to the Lieutenant-Governor of British Columbia for the information of his Government.

Humbly submitted.

(Signed.) Charles J. Doherty.
Minister of Justice.

Certified Copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor-General on the 30th May, 1918.

The Committee of the Privy Council have had under consideration the annexed report from the Minister of Justice, dated 21st May, 1918, recommending, for the reasons therein stated, that the Statute of the Legislature of British Columbia, chapter 71 of 7 & 8 Geo. V. (1917), assented to on the 19th day of May, 1917, and received by the Secretary of State for Canada on the 31st day of May, 1917, intituled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" be disallowed.

The Committee concur in the views of the Minister of Justice as set out in the said report, and advise that the said Act be disallowed accordingly.

The Committee, on the recommendation of the Minister of Justice, further advise that a copy hereof and of the accompanying report, if approved, be transmitted to the Lieutenant-Governor of British Columbia for the information of his Government; also that copies be transmitted to the petitioners, the Esquimalt & Nanaimo Railway Company, Canadian Collieries, Limited, and the National Trust Company, Limited.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU.
Clerk of the Privy Council.

His Honour the Lieutenant-Governor of British Columbia.

OTTAWA, 21st May, 1918.

To His Excellency the Governor-General in Council:

The undersigned has had under consideration a Statute of the Legislature of British Columbia, chapter 71 of 7 & 8 Geo. V. (1917), assented to on 19th May, 1917, and received by the Secretary of State for Canada on 31st May, intituled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904.'" This is a very short Act, consisting of two sections, which are here reproduced as follows:—

"1. This Act may be cited as the 'Vancouver Island Settlers' Rights Act, 1904, Amendment Act, 1917.'

"2. Section 3 of the 'Vancouver Island Settlers' Rights Act, 1904,' being chapter 54 of the Statutes of 1904, is hereby amended by striking out the words 'within twelve months from the coming into force of this Act' in the second and third lines of said section, and inserting in lieu thereof the words 'on or before the first day of September, 1917.'"

It will be observed that this amendment, upon the face of it, merely extends to the 1st day of September, 1917, a time which had been limited by the "Vancouver Island Settlers' Rights Act, 1904," and by reference to the latter Act it will be perceived that the time so limited had expired on 10th February, 1905. But involved in this very simple legislative expedient is an invasion of valuable proprietary rights which has occasioned an application for disallowance based upon irresistible grounds.

The Act of 1904 recites an intention to make provision for persons who had settled upon lands within the belt reserved for railway purposes on Vancouver Island by Order in Council of 30th June, 1873, for the purpose of implementing section 11 of the Terms of Union upon which British Columbia entered the Confederation, and that the said settlers are entitled to peaceable and absolute possession of the land occupied by them and title thereto in fee-simple in accordance with the Statutes of British Columbia at the time existing governing the disposal of public lands; and it proceeds to enact that upon application on behalf of any settler to the Lieutenant-Governor in Council within twelve months from the coming into force of the Act, which was assented to on 10th February, 1904, showing that the settler had occupied or improved land within the Railway Belt prior to the enactment of the "Settlement Act" of 1883, cap. 14 of 47 Vict., with the *bona-fide* intention of living on the said land, accompanied by reasonable proof, a grant of the fee-simple in such land should be issued to him or his legal representative, free of charge, and in accordance with the provisions of the "Land Act" in force at the time when said land was first occupied or improved by the settler; and, moreover, that the rights granted to the settlers under the said Act should be asserted by and defended at the expense of the Crown.

Application for the disallowance of the Act of 1904 was made to His Excellency the Governor-General in Council upon petition of the Esquimalt & Nanaimo Railway Company, setting forth, as the fact was, that the lands within the Railway Belt were granted to the Dominion Government for the purposes of constructing and to aid in the construction of a railway between Esquimalt and Nanaimo; that the Dominion had contracted by statutory authority for the construction of the railway upon terms that these lands, in so far as they might be vested in Her late Majesty, or held by Her Majesty for the purposes of constructing or to aid in the construction of the railway, should be conveyed to the contractors upon completion of the work to the satisfaction of the Governor in Council; that it was, moreover, agreed by the contract that the land was to be granted to the company subject to the stipulation, proviso, or exception, *inter alia*, that every *bona-fide* squatter who had previously occupied or improved any

of the said lands for a period of one year prior to the 1st day of January, 1883, should be entitled to a grant of the freehold of *the surface rights* of the said squatted land to the extent of 160 acres at the rate of $1 per acre; that the Esquimalt & Nanaimo Railway Company completed the work to the satisfaction of the Governor in Council and received from the Dominion a grant of the lands, subject to the statutory terms and provisions. Upon these and other allegations, which will appear upon reference to the papers herewith, the Esquimalt & Nanaimo Railway Company submitted that the Act should be disallowed as affecting an unjust confiscation of the company's rights in the property. No question was suggested as to the rights which by the legislation of 1883 the squatters were recognized to possess, and by which the title of the company was affected, but it appeared that the squatters were not satisfied with the provision made for them, and that they had agitated claims which had been the subject of investigation, with the result that they were found entitled to further consideration by the Provincial authorities. These facts were set up by the Government of British Columbia in reply to the petition presented by the company, and the Government endeavoured to justify the legislation by the submission of an argument intended to show that certain settlers who had, previously to the "Settlement Act" of 1883, recorded tracts of unoccupied, unsurveyed, and unreserved Crown lands had acquired a right by the legislation then in force to obtain title to the lands so recorded; that this right continued irrespective of the provisions of the "Settlement Act," or was not affected by those provisions, and that the Legislature did not thereby convey to the Dominion any lands within the Railway Belt to which the settlers had lawful claim; it was suggested that the alleged right of these settlers, although, in the absence of further legislation, incapable of vindication at their own suit, could be asserted by action brought either by the Attorney-General on behalf of the Province, or by the settlers themselves with the aid of a Provincial legislative grant, and it was the latter course, as stated by the Provincial reply, which commended itself to the Advisers of the Lieutenant-Governor.

It may be observed here, without inquiring further into the merit of this argument, that, whatever weight the argument may possess as to settlers of the description to which it applies, the settlers who are benefited by the Act of 1904 are defined to mean those persons "who prior to the passing of the said Act (chapter 14 of 47 Vict.) occupied or improved lands situated within the said Railway Belt with the *bona-fide* intention of living thereon," and that settlers of this description are not distinguishable from those who are otherwise named squatters.

By the report of the Minister of Justice upon the application for the disallowance of the legislation of 1904, approved by His Excellency in Council on 21st June of that year, the Minister stated that it was unnecessary to enter minutely into the history of the Railway Belt; that it was sufficient to state that it was set apart in pursuance of the Terms of Union with British Columbia to be appropriated in furtherance of the construction of the proposed railway to connect British Columbia with the Eastern Provinces; that by the "Settlement Act" of 1883 the Railway Belt was granted to the Dominion Government for the purpose of constructing and to aid in the construction of the Esquimalt & Nanaimo Railway; that the Dominion in turn had granted the property to the company, and that under these circumstances, if the Act would have the effect apprehended by the Railway Company of divesting the company of its title granted by the Government of Canada in respect of any of the lands in the Belt, the Minister would feel it to be his duty to recommend disallowance in order to prevent the consummation of such an injustice. The Minister considered, however, that the Act could not have this effect for reasons which he stated; but unfortunately it transpired ultimately by the judgment of the Judicial Committee of the Privy Council in the case of McGregor *vs.* Esquimalt & Nanaimo Railway Company, 1907 Appeal Cases, 462, that the Provincial grants authorized by the Statute did operate to convey the fee-simple, notwithstanding the previous transfers or conveyances as between the Governments and as between the Dominion and the respondent company. In the meantime the Esquimalt & Nanaimo Railway Company, which had been constructed and was being worked under Provincial powers, was by Dominion Statute of 1905 declared to be a work for the general advantage of Canada, and the Provincial powers of legislation with regard to the company were thereby transferred, but this circumstance was, upon ordinary principles, held not to affect the consideration of rights in the pending case. Subsequently, in view of the result of the litigation, the company succeeded in obtaining from the Government of British Columbia an agreement of indemnity or for compensation in respect of the lands of which the company

had been thus deprived, and this arrangement is evidenced by Provincial Statute, chapter 17 of 1910, which does not, however, extend to provide any compensation for the loss to which the company is subjected by the operation of the present Statute.

The Esquimalt & Nanaimo Railway Company, the Canadian Collieries (Dunsmuir), Limited, and the National Trust Company, Limited, have now submitted a joint petition for disallowance of the Statute, chapter 71 of 1917, copy of the petition submitted herewith, and these companies represent that the legislation constitutes an undue interference with the policy of the Dominion in respect of the disposition whereby in the general public interest the Railway Belt was made available to the Esquimalt & Nanaimo Railway Company in consideration of the building of the railway, abrogating *pro tanto* the agreement between the Dominion and the Province of 1883, and derogating from the grant made by the Dominion to the Railway Company in pursuance of the general arrangement, and, moreover, divesting the Railway Company and the Canadian Collieries, claiming under the company, as well as the bondholders represented by the Trust Company, of a very valuable portion of their assets or security; the lands in question being coal-bearing lands of great value, either as ascertained or in prospect.

Upon reference of the petition for the consideration of the local Government the Attorney-General of the Province submitted in reply a memorandum, copy herewith, in which he urges that the amending Act involves no principle not sanctioned by the Act of 1904, and that, since the latter Act was permitted to remain in operation, Your Excellency's Government, for the sake of consistency, should reject the petitioners' claim. The Attorney-General, however, relies principally upon the fact, which the petitioners indeed may admit without affecting their case, that the settlers had claims which were entitled to be considered, and that this fact was recognized not only locally, but by the Government of the Dominion, which issued a Commission in 1897 to inquire into the matter. The Commissioners' report is quoted, finding that, although the settlers, speaking generally, had no legal claim to the coal and other minerals under their lands, they had a just claim for redress at the hands of the Province, which it was the duty of the Province to accommodate. Upon these findings the Attorney-General contends, remarkably enough, that the legislation is in keeping with the policy of the Dominion, because the Dominion caused the claims of the settlers to be investigated, and in execution of the duty and obligations of the Province, because it was found that the Province should compensate the settlers. He urges, moreover, that the Act is *intra vires* of the Province, which is not denied, and that disallowance would involve a serious interference with Provincial rights.

The petitioners having expressed a desire that counsel should be heard on their behalf, an appointment was made, in exception to the ordinary procedure for consideration of applications for disallowance, and the Attorney-General was notified as well as the petitioners. The argument was heard before the Prime Minister, the undersigned, and the Minister of Public Works, counsel representing the three petitioning companies, and also, in opposition, the Granby Consolidated Mining, Smelting, and Power Company, Limited, which is understood to claim under grants issued by the Province pursuant to the authority of the Act under consideration. The Attorney-General of British Columbia was not represented, but presumably the Granby Company was notified by the Attorney-General, and represented views with which he was in accord. At the hearing the matter was very fully discussed, and the principal argument presented in support of the legislation on behalf of the Granby Company, which was the only interest appearing to uphold the legislation, was that the settlers' claims had been of long standing, antedating in their origin the legislation under which the title passed from the Province to the Dominion, and from the Dominion to the Esquimalt & Nanaimo Railway Company; that the quieting of these claims was eminently a proper matter for disposition by the local Legislature, and that Your Excellency's Government ought not to review the conclusions reached and Provincially sanctioned for the settlement of these claims.

On the other hand, it was urged, and in fact it was not denied, that the company had received its land grant in pursuance of the agreement of the Government of Canada founded upon legislation sanctioned by the Dominion and the Province, which defined precisely the measure of the settlers' claims; that large pecuniary interests were involved, and that the companies were not in anywise responsible for the settlers' claims, or affected by them, otherwise than in so far as the Act in question, or the exercise of the powers conferred by the Act, might operate to transfer the title or diminish the area of the company's coal-bearing lands.

It will be observed that, although after the effect of the Statute of 1904 had been judicially declared, an agreement was reached between the Railway Company and the Province, as evidenced by the Statute of 1910, to afford the company a measure of compensation for the loss which it had suffered through the operation of the Act; no provision is now made or suggested to compensate for the loss which the petitioners suffer by reason of the further grants issued under the authority of the present legislation, and, indeed, it is urged on their behalf that it is impossible in the present state of development of the property to realize the loss to which they are subjected by reason of the granting of their lands and mineral rights by the Province under the authority of the Statute.

In these circumstances the question which presents itself for Your Excellency's consideration is whether it is compatible, with a proper fulfilment of the duty charged upon Your Excellency in relation to the power of disallowance, that the Act now in question should be permitted to remain in operation.

It will be perceived by review of the reports of the Ministers of Justice from the Union to the present time that there has been great reluctance to interfere with Provincial legislation, and that, notwithstanding a considerable number of cases in which disallowance was sought upon established grounds, perhaps not more than a single Statute has been actually disallowed by reason merely of the injustice of its provisions. Cases are not lacking, however, in which disallowance has been avoided by reason of amendments undertaken by the local authorities, upon the suggestion of the Ministers of Justice, to remedy the complaints against the original Acts; and certainly the constitutional propriety and duty of reviewing Provincial legislation upon its merits when it is the subject of serious complaint has been maintained by every succeeding Minister of Justice from the time of the Union, save only the immediate predecessor of the undersigned, who suggested in effect that the power had become obsolete. In the opinion of the undersigned the power is unquestionable and remains in full vigour. Indeed, the very careful consideration which the Ministers have been accustomed to give to applications presented from time to time for disallowance depending upon reasons of inequality or hardship is inconsistent with any other view. But although the Governor in Council exercises constitutionally a power of review and control, he is certainly not responsible for the policy, wisdom, or expediency of Provincial legislation, and therefore he should not disallow merely because an Act is in his judgment ill-advised, untimely, or defective; or because its project lacks either in principle or detail that degree of equity and consideration of the existing situation which in the opinion of the Governor in Council should have commended itself to the Legislature. Indeed, it must be realized in the exercise of the power of disallowance that legislative judgment upon Provincial matters is committed to the Legislatures and not to Your Excellency in Council, and that the former therefore have a reasonable and just degree of freedom to work out their measures of legislation in the manner which the legislatures deem requisite or advisable or best adapted reasonably to provide for the situation in hand. On the other side, it cannot be denied that there are principles governing the exercise of legislative power, other than the mere respect and deference due to the expression of the will of the local constituent assembly, which must be considered in the exercise of the prerogative of disallowance. It may be difficult, and it is not now necessary to define these principles for purposes of general application; certainly, although legislative interference with vested rights or the obligation of contracts, except for public purposes and upon due indemnity, are processes of legislation which do not appear just or desirable, nevertheless, it would, in the opinion of the undersigned, be formulating too broad a rule to affirm that local legislation affected by these qualities should in all cases be displaced by means of the prerogative.

The present case is, however, of very exceptional character, and it must fall within any just limitation of the rule. There can be no doubt about the intention of the enactment having regard to the sequence and history of the legislation. A large area of valuable land was transferred by the Province to the Dominion destined and appropriated by statutory arrangement and sanction as between the two Governments for the benefit of the Esquimalt & Nanaimo Railway Company, which undertook the burden of constructing and operating the railway. These lands were in turn transferred by the Dominion to the company upon the terms of its contract. The stipulations as to title were precise and definite, and the situation, claims, or rights of settlers and squatters were particularly considered and provided for. The settlers

were accorded the right to obtain grants of 160 acres for a period of four years upon payment of $1 per acre, and squatters who had been on the land for the purpose of improving it for at least one year were entitled to receive the surface rights only of 160 acres each upon payment of the like price. Subject to these conditions the lands passed to the company, and the company is certainly justified to look not only to the Province, but also to the Dominion, with whom it contracted and from whom it received its grant, to see that its title is not impaired by legislative revision of the terms after performance of the contract by which the lands were earned. The identic legislation on the part of the Province and of the Dominion of 1883 evidences a matter of Dominion as well as of local policy which has its foundation in the terms upon which British Columbia entered the Union, by which, in consideration of the construction, equipment, and undertaking to operate and maintain the railway, the company received the statutory subsidies, including the lands in question, subject to the special accommodation of the claims of settlers and squatters, for which provision was expressly made; and the process by which, notwithstanding these solemn assurances, a valuable portion of the property which it was thus intended that the company should receive, and which the company did receive, is taken away by the exercise of the legislative authority of one of the parties to the tripartite agreement cannot adequately be characterized in terms which do not describe an unjustifiable use of that authority, in conflict with statutory contractual arrangements to which the Government of Canada as well as the Province was a party. The Railway Company, the Collieries Company, as assignee of some of these lands, and the bondholders who have loaned their money to assist in the operation of the mines upon security of a statutory title, the most conclusive which the law knows, submit their case for the consideration of Your Excellency in Council; they invoke the powers conferred by the "Constitutional Act"; and the undersigned, in agreement with his predecessor of 1904, considers that both the proper execution of these powers, and the obligation of honour and good faith in the administration of the transaction on the part of Your Excellency in Council, require that the Province should not be permitted substantially to diminish the consideration of the contract.

Upon the submission of the Attorney-General that disallowance would involve a serious interference with Provincial rights, the undersigned observes that Provincial rights are conferred and limited by the "British North America Acts," and while the Provinces have the right to legislate upon the subjects committed to their legislative authority, the power to disallow any such legislation is conferred by the same constitutional instrument upon the Governor-General in Council, and incident to the power is the duty to execute it in proper cases. This power and the corresponding duty are conferred for the benefit of the Provinces as well as for that of the Dominion at large. The system sanctioned by the Act of 1867, as interpreted by the highest judicial authority, "provides for the federated Provinces a carefully balanced constitution, under which no one of the parts can pass laws for itself, except under the control of the whole acting through the Governor-General." The mere execution of the power of disallowance does not therefore conflict with Provincial rights, although doubtless the responsibility for the exercise of the power which rests with Your Excellency in Council ought to be so regulated as not to be made effective except in those cases in which, as in the present case, the propriety of exercising the power is demonstrated.

The undersigned recommends, therefore, that the said Statute, chapter 71 of 1917, intituled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" be disallowed, and that a copy of this report, if approved, be transferred to the Lieutenant-Governor of British Columbia for the information of his Government; also that copies be transmitted to the petitioners, the Esquimalt & Nanaimo Railway Company, Canadian Collieries, Limited, and the National Trust Company, Limited.

Humbly submitted.

(Signed.) CHARLES J. DOHERTY.
Minister of Justice.

AT THE GOVERNMENT HOUSE AT OTTAWA.

THURSDAY, the 30th day of May, 1918.

PRESENT:

HIS EXCELLENCY THE GOVERNOR-GENERAL IN COUNCIL.

Whereas the Lieutenant-Governor of the Province of British Columbia, with the Legislative Assembly of that Province, did on the 19th day of May, 1917, pass an Act, chaptered 71, and intituled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904'":

And whereas the said Act has been laid before the Governor-General in Council, together with a report from the Minister of Justice, recommending that the said Act should be disallowed:

Therefore, His Excellency the Governor-General in Council has this day been pleased to declare his disallowance of the said Act, and the same is hereby disallowed accordingly.

Whereof the Lieutenant-Governor of the Province of British Columbia and all other persons whom it may concern are to take notice and govern themselves accordingly.

RODOLPHE BOUDREAU.
Clerk of the Privy Council.

His Honour the Lieutenant-Governor of British Columbia.

I, Victor Christian William, Duke of Devonshire, Governor-General of Canada, do hereby certify that the Act passed by the Legislature of the Province of British Columbia on the 19th day of May, 1917, chaptered 71, and intituled "An Act to amend the 'Vancouver Island Settlers' Rights Act, 1904,'" was received by me on the 31st day of May, 1917.

Given under my hand and seal this thirtieth day of May, nineteen hundred and eighteen.

[SEAL.] DEVONSHIRE.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

PRINTING OFFICE REPORT.

To His Honour Sir Frank Stillman Barnard, K.C.M.G.,
Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

In accordance with section 14 of the "Statutes and Journals Act," I have the honour to present the following Report.

I have the honour to be,
Sir,
Your obedient servant,

J. D. MacLEAN,
Provincial Secretary.

PRINTING OFFICE REPORT.

RETURN showing the number of copies of the Statutes, Journals, and Sessional Papers which have been bound, distributed, and disposed of during the twelve months ending 31st March, 1917, and the number remaining on hand on the 31st March, 1917, together with a statement of the work performed in the Printing Office, and the expenses incurred by the Department during that period, in accordance with the "Statutes and Journals Act."

Year.	Statutes.					Journals.					Sessional Papers.					Work Performed.					Expenses of Department.			
	On hand 1st April, 1916.	Bound.	Distributed.	Sold.	Remaining on hand 31st March, 1917.	On hand 1st April, 1916.	Bound.	Distributed.	Sold.	Remaining on hand 31st March, 1917.	On hand 1st April, 1916.	Bound.	Distributed.	Sold.	Remaining on hand 31st March, 1917.	No. of Jobs.	No. of Pages. Plain.	No. of Pages. Tabular.	Total No. of Pages	No. of Impressions Printed.	Salaries.	Printing Material, Paper, etc.	Total.	Revenue Received.
1872	.....	.....	.....	.....	.....	13	.....	.....	.....	13	.....	.....	.....	.....	.....									
1875	6	.....	.....	3	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1876	16	.....	.....	3	13	19	.....	.....	.....	19	.....	.....	.....	.....	.....									
1878	.....	.....	.....	.....	.....	9	.....	.....	.....	9	.....	.....	.....	.....	.....									
1880	.....	.....	.....	.....	.....	8	.....	.....	.....	8	.....	.....	.....	.....	.....									
1886	22	.....	.....	7	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1887	35	.....	.....	.....	35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1888	25	.....	.....	.....	25	6	.....	.....	.....	6	.....	.....	.....	.....	.....									
C.A. 1888	3	.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1889	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1890	.....	.....	.....	.....	.....	13	.....	.....	.....	13	.....	.....	.....	.....	.....									
1891	.....	.....	.....	.....	.....	10	.....	.....	.....	10	.....	.....	.....	.....	.....									
1892	.....	.....	.....	.....	.....	10	.....	.....	.....	10	.....	.....	.....	.....	.....									
1893	.....	.....	.....	.....	.....	17	.....	.....	.....	17	.....	.....	.....	.....	.....									
1894	.....	.....	.....	.....	.....	8	.....	.....	.....	8	.....	.....	.....	.....	.....									
1895	1	.....	.....	.....	1	23	.....	.....	.....	23	.....	.....	.....	.....	.....									
1896	2	.....	.....	1	1	32	.....	.....	.....	32	.....	.....	.....	.....	.....									
1897	1	.....	.....	.....	1	32	.....	.....	.....	32	.....	.....	.....	.....	.....									
R.S. 1897	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1898	.....	.....	.....	.....	.....	11	.....	.....	.....	11	.....	.....	.....	.....	.....									
1899	.....	.....	.....	.....	.....	12	.....	.....	.....	12	.....	.....	.....	.....	.....									
1901	1	.....	.....	.....	1	.....	.....	.....	.....	.....	36	.....	.....	.....	36									
1902	.....	.....	.....	.....	.....	36	.....	.....	.....	36	.....	.....	.....	.....	.....									
1903	.....	.....	.....	.....	.....	45	.....	.....	.....	45	36	.....	.....	.....	36									
1903–4	.....	.....	.....	.....	.....	12	.....	.....	.....	12	1	.....	.....	.....	1									
1905	.....	.....	.....	.....	.....	13	.....	.....	.....	13	25	.....	.....	.....	25									
1906	.....	.....	.....	.....	.....	41	.....	.....	.....	41	34	.....	.....	.....	34									
1907	132	.....	.....	.....	132	20	.....	.....	.....	20	.....	.....	.....	.....	.....									
1908	92	.....	.....	2	90	2	.....	.....	.....	2	.....	.....	.....	.....	.....									
1909	80	...	25	2	53	58	.....	.....	.....	58	23	.....	.....	.....	23									
1910	140	.....	...	2	138	42	.....	.....	...	42	33	.....	.....	.....	33									
1911	63	.....	1	4	58	155	.....	.....	.....	155	.....	...	...	.....	.....									
R.S. 1911	28	.....	7	17	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....									
1912	382	.....	4	17	361	240	.....	...	.....	240	82	.....	...	.....	82									
1913	447	.....	5	24	418	180	.....	.....	.....	180	26	.....	.....	.....	26									
1914	150	.....	6	25	119	207	.....	.....	.....	207	9	.....	.....	.....	9									
1915	194	.....	8	45	141	63	.....	.....	.....	63	16	.....	.....	.....	16									
1916	426	.....	10	388	28	162	.....	.....	.....	162	6	.....	.....	.....	6									
Vol. 4, R.S. 1911.	36	.....	.....	22	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,472	13,455	1,268	14,723	6,343,109	$87,887 60	$40,316 36	$128,203 96	$39,694 36

MEMO.—In noting the quantity of work performed for the period, it should be borne in mind that the majority of the tabular work was printed in very small type (Nonpareil), nearly all of the pages containing not less than 6,600 ems, and that, according to established rules, double composition should be allowed for this description of work. Although the above return shows the net results for the period, yet a large amount of unavoidable additional work was necessitated by making alterations from the original drafts in Bills submitted to the Legislature, and in reports and other documents, which it is impossible to include in this return.

Persons and Departments to whom Statutes, Journals, and Sessional Papers have been distributed during twelve months ending March 31st, 1917.

To Whom Distributed.	Statutes, 1917.	Journals, 1917.	Sessional Papers, 1917, 2 Vols.
Members of the Legislative Assembly	81	81	81
Senators	5	5	5
Members of the House of Commons	7	7	7
Provincial Departments—			
His Honour the Lieut.-Governor, Victoria	1	1	1
Lieut.-Governor's Office, "	.....	.....	1
Premier's Office, "	.....	.....	1
President, Executive Council, "	.....	1	1
Provincial Secretary, "	1	1	1
Deputy Provincial Secretary, "	1	1	1
Provincial Secretary's Department, "	1	1	1
Attorney-General, "	1	1	1
Deputy Attorney-General, "	1	1	1
Attorney-General's Department, "	2	1	1
Departmental Solicitor, "	1	.....	.....
Minister of Finance, "	1	1	1
Deputy Minister of Finance, "	1	1	1
Comptroller-General, "	1	1	1
Minister of Lands, "	1	1	1
Deputy Minister of Lands, "	1	1	.....
Lands Department, "	1	.....	1
Public Works Engineer, "	1	1	1
Minister of Works, "	1	1	1
Deputy Minister of Works, "	1	1	.....
Works Department, "	.....	.....	1
Minister of Mines, "	1	1	1
Deputy Minister of Mines, "	1	1	1
Printing Office, "	3	3	3
Executive Council, "	1	1	1
Superintendent of Education, "	1	1	1
Registrar-General of Titles, "	1	.....	.....
Superintendent of Police, "	1	.....	.....
Water Commissioner, "	1	.....	.....
Railways Department, "	1	.....	.....
Legislative Library, "	18	18	18
Surveyor-General, "	1	.....	.....
Minister of Agriculture, "	1	.....	.....
Deputy Minister of Agriculture, "	1	.....	.....
Library Dep. of Agriculture, "	1	.....	1
Live Stock Commissioner, "	1	.....	.....
Provincial Assayer, "	1	.....	.....
Inspector of Legal Offices, "	1	.....	.....
Assessor and Collector, "	1	.....	.....
Registrar of Joint-stock Companies, "	1	.....	.....
Surveyor of Taxes, "	1	.....	.....
Inspector of Trust Companies, "	1	.....	.....
Inspector of Municipalities, "	1	.....	.....
Clerk, Legislative Assembly, "	1	1	.....
Law Clerk, Legislative Assembly, "	1	1	.....
Provincial Board of Health, "	1	.....	1
Game Warden, "	1	.....	1
Judges of Appeal Court, "	6	.....	.....
" " Vancouver	5	.....	.....
Chief Justice	1	.....	.....
Judges of Supreme Court	6	.....	.....
District Registrar of Titles, Vancouver	1	.....	.....
" " New Westminster	1	.....	.....
" " Kamloops	1	.....	.....
" " Nelson	1	.....	.....
" " Prince Rupert	1	.....	.....
Registrar, Supreme Court, Vancouver	1	.....	.....
" " Cranbrook	1	.....	.....
" " Prince Rupert	1	.....	.....
" " New Westminster	1	.....	.....
" " Revelstoke	1	.....	.....
" " Nelson	1	.....	.....
" " Victoria	1	.....	.....
" County Court, Nanaimo	1	.....	.....
" " Chilliwack	1	.....	.....
" " Vancouver	1	.....	.....
" " Victoria	1	.....	.....
" " Trout Lake	1	.....	.....
" " Atlin	1	.....	.....
County Court Judge, Nanaimo	1	.....	.....
" " Prince Rupert	1	.....	.....
" " Grand Forks	1	.....	.....
" " New Westminster	1	.....	.....
" " Kamloops	1	.....	.....
" " Ashcroft	1	.....	.....
" " Nelson	1	.....	.....
" " Vancouver	3	.....	.....
Carried forward	201	136	139

To Whom Distributed.	Statutes, 1917.	Journals. 1917.	Sessional Papers, 1917.
Brought forward	201	136	139
Provincial Departments—*Concluded.*			
County Court Judge, Victoria	1		
" " Cranbrook	1		
" " Prince George	1		
Sheriffs—			
Victoria	1		
Vancouver	1		
Nelson	1		
New Westminster	1		
Kamloops	1		
Grand Forks	1		
Nanaimo	1		
Quesnel	1		
Golden	1		
Prince Rupert	1		
Revelstoke	1		
Prince George	1		
Law Library, Victoria	3		
" Vancouver	3		
" New Westminster	2		
" Kamloops	1		
" Nelson	1		
" Fernie	1		
" Greenwood	1		
" Vernon	1		
" Cranbrook	1		
" Grand Forks	1		
" Prince George	1		
Fruit Inspector, Vancouver	1		
Assessor and Collector, Vancouver	1		
Inspector of Mines, Fernie	1		
Provincial Timber Inspector, Vancouver	1		
Superintendent of Prison Farm, Oakalla	1		
Dr. F. F. Wesbrook, President, University of British Columbia, Vancouver	1		
John Conway, Mining Recorder, Stewart, B.C.	1		
Government Agents—			
Duncan	1		
Nanaimo	1		
Cumberland	1		
Barkerville	1		
New Westminster	1		
Ashcroft	1		1
Clinton	1		1
Kamloops	1		
Golden	1		1
Revelstoke	2		
Vernon	1		1
Alberni	1		
Nelson	1		
Cranbrook	1		
Atlin	2		
Telegraph Creek	1		
Rossland	1		
Prince Rupert	1		
Kaslo	1		1
Vancouver	1		
Nicola	1		
Fairview	1		
Grand Forks	1		
Hazelton	1		
Greenwood	1		
Fernie	1		
150-Mile House	1		
Wilmer	1		
Princeton	1		
Queen Charlotte City	1		
Fort Fraser	1		
South Fort George	1		
Quesnel	1		
Anyox	1		1
Stipendiary Magistrates—			
New Denver	2		
Rossland	1		
Penticton	1		
Cumberland	1		
Trail	1		
Grand Forks	1		
Fernie	1		
Victoria	1		
Ashcroft	1		
Enderby	1		
Cranbrook	1		
Merritt	1		
New Westminster	1		
Masset	1		
Summerland	1		
Carried forward	291	136	145

To Whom Distributed.	Statutes, 1917.	Journals, 1917.	Sessional Papers, 1917.
Brought forward	291	136	145
Stipendiary Magistrates—*Concluded.*			
Kerrisdale	1		
Courtenay	1		
Silverton	2		
Prince George	1		
South Vancouver	1		
Edmonds	1		
Kamloops	1		
Vancouver	1		
Ocean Falls	1		
Agassiz	1		
Chase	1		
Bella Coola	1		
Nelson	1		
Justices of the Peace—			
W. R. Hillyer, Solsqua	1		
Malcolm B. J. Reid, Immigration Branch, Vancouver	1		
Thos. Wilson, Brackenbrae Farm, Stave Falls	1		
Maurice A. Porter, Royal Bay, R.R. Route No. 1, Victoria	1		
Arthur F. Priestley, Ayansh	1		
Fred'k F. Higgs, Albert Head	1		
Jas. F. Summerfield, care of W. C. Brown, 403-407 Rogers Buildings, Vancouver	1		
Percy T. R. Carnac, Box 116, Chemainus	1		
Aaron B. Ball, Comox	1		
Chas. King, Greenwood	1		
Leonard E. Farr, Armstrong	1		
Wm. H. Jones, 912 Edgewood Avenue, Nelson	1		
Alfred Adams, "The Glen," R.R. No. 1, Vernon	1		
M. A. Wylde, Shawnigan	1		
W. C. Findlay, Parliament Buildings, Victoria	1		
J. W. Ambery, 518 Fort Street, Victoria	1		
R. E. Walker, "Ragley," East Sooke	1		
J. Dixon, Natal	1		
Edward Graham, Denman Island	1		
Geo. H. Outram, Vanderhoof	1		
Samuel J. Emanuels, 419 Pender Street W., Vancouver	1		
John Roberts, Box 223, Field	1		
O. J. Reid, Chilco	1		
Edwin W. Widdowson, Nelson	1		
N. W. Burdeth, Kimberley	1		
Geo. Leece, Drawer 509, Ymir	1		
John H. Hayes, Fort Steele	1		
E. H. Robinson, Alert Bay	1		
Provincial Constables—			
Greenwood	1		
Hazelton	1		
Kamloops	1		
Golden	1		
Fernie	1		
Nelson	1		
Nanaimo	1		
Prince Rupert	1		
Vancouver	2		
Vernon	1		
Ashcroft	1		
South Fort George	1		
Fort St. John, care of Hudson's Bay Co., Edmonton	1		
Telkwa	1		
Clinton	1		
Dominion Departments—			
Library of Parliament, Ottawa	1	1	4
Law Clerk, House of Commons	1	1	
Commissioner of the Yukon Territory, Dawson, Y.T.	1		
Deputy Minister of Justice, Ottawa	2		
Minister of Justice, Ottawa	1		
Supreme Court Library, Ottawa	2		
Judges' Library, Ottawa	2	1	
Librarian, House of Parliament, Ottawa	1	1	
Jas. White, Secretary, Committee of Conservation, Ottawa	1		
Under-Secretary of State, Ottawa	1	1	
Minister of Labour, Ottawa	1		
Law Clerk, Senate, Ottawa	1		
Secretary of State, Ottawa (for Colonial Office, London)	6		
Sir E. P. Morris, Premier, St. Johns, Newfoundland			1
Board of Trade, Victoria, B.C.			1
T. K. Doherty, Institute Commissioner Agricultural Department, Ottawa	1		1
Superintendent of Immigration, Ottawa	1		
Deputy Postmaster, Ottawa	1		
Public Archives of Canada, Ottawa	1		
Great Britain—			
House of Lords (Library)	1		
House of Commons	1	1	1
British Museum, Great Russel Street, Bloomsbury, W.C.	1	1	1
Imperial Institute, South Kensington, S.W.	1	1	1
Royal Colonial Institute, 18 Northumberland Avenue, Charing Cross, W.C.	1	1	1
British Library of Political Science, Clare Market, W.C.	1		
Carried forward	381	145	156

To Whom Distributed.	Statutes, 1917.	Journals, 1917.	Sessional Papers. 1917.
Brought forward	381	145	156
Great Britain—*Concluded.*			
Society of Comparative Legislation, 5 New Square, Lincoln's Inn, London, W.C.	1		
Secretary of State for the Colonies, Downing Street	1	1	1
High Commissioner for Canada	1	1	1
Blake & Redden (Privy Council Library), 17 Victoria Street, London	1	1	
Gard, Lyell & Co., 2 Gresham Buildings, London, E.C.	1		
Hon. J. H. Turner, Agent-General for British Columbia	1	1	1
Hamer Greenwood, M.P., 4 Crown Office Road, Temple	1		
Law Library, Colonial Office, London	1		
Middle Temple Library, London, E.C.	1		
The Registrar, Privy Council Office, Downing Street, London	1		
Library of Inner Temple, London	1		
Library of Lincoln's Inn, London	1		
Board of Trade, London	1		
Incorporated Law Society, London	1		
Faculty of Gray's Inn, London	1		
Faculty of King's Inn, Dublin	1		
Library of the Faculty of Advocates, Edinburgh	1		
Solicitor's Hall, Edinburgh	1		
Bar Library, Royal Courts of Justice, London	1		
Estates Branch, Canadian Contingents, Westminster House, 7 Millbank, London, S.W.	1		
Provinces—			
Osgoode Hall, Toronto	1	1	1
Legislative Library, Toronto	1	1	1
" " Quebec	1	1	1
" " Winnipeg	1	1	1
" " Halifax	1	1	1
" " Fredericton	1	1	1
" " St. Johns, Newfoundland	1	1	1
" " Charlottetown	1	1	1
" " Edmonton, Alta	1	1	1
" " Regina, Sask	1	1	1
Deputy Attorney-General, Winnipeg	1		
King's Printer, Halifax	1	1	1
Attorney-General, Halifax	1		
Attorney-General's Department, Edmonton, Alta	1		
Attorney-General's Department, Regina, Sask	1		
King's Printer, Quebec	1		
Miscellaneous—			
Canadian Offices, 17 Boulevard des Capucines, Paris	1	1	1
McGill University, Montreal	1	1	1
Laval University, Montreal	1	1	1
Queen's University, Kingston	1	1	1
Dalhousie University, Halifax	1		1
University of Alberta, Strathcona	1	1	1
University of Saskatchewan, Saskatoon	1		1
W. R. Foster, Secretary, Barrister's Society, Halifax	1		
Calgary Public Library, Calgary, Alta.	1		1
J. F. Bursill, Collingwood, South Vancouver			1
Chas. H. Hutchings, Deputy Minister of Justice, St. Johns, Newfoundland	1		
American Consul, Vancouver, B.C.	1		
Montreal Bar Library, Montreal	1	1	5
International Labour Office, Basle, Switzerland	1		
Office du Travail, Brussels	1		
Acting Consul-General, Belgian Consulate, Ottawa	1		
University Women's Club, Vancouver	1		
A. B. Buckworth, J.P., Winch Bldg., Vancouver	1		
Donald Downie, Revising Judge of Incoming Assessments & Appeal, Vancouver, B.C	1		
B.C. University Library, Vancouver, B.C.			1
Public Library, Vancouver, B.C.			1
D. A. MacRae, Dean, Dalhousie University, Halifax, N.S	1		
Hon. Mr. Justice Riddell, Osgoode Hall, Toronto	1		
Miscellaneous (United States)—			
State Library, Boston	1		
Public Document Department, Public Library, New York (476 Fifth Avenue)	1	1	1
State Library, St. Paul, Minn.	1		1
Sociology Library, Law Section, Albany, N.Y	1		1
State Library, Concord, N.H	1		
" Boise, Idaho	1		1
" Lincoln, Neb	1		1
" Helena, Montana	1		1
" Denver, Colorado	1		1
" Madison, Wis	1		1
" Cheyenne, Wyo.	1		1
" Hartford, Conn	1	1	1
" Salem, Ore	1	1	1
" Olympia, Wash	1		1
" Atlanta, Georgia	1		
Library of Congress, Washington, D.C.	1	1	1
Library Department of Attorney-General, Washington, D.C.	1		
Newberry Library, Chicago, Ill.	1		
State Law Library, Augusta, Maine	1		
Public Law Library, Seattle, Wash.	1		1
Law Library, Dayton, Ohio	1		
State Library, Des Moines, Iowa	1		1
Library, University of Washington, Seattle	1		1
Carried forward	460	170	202

To Whom Distributed.	Statutes, 1917.	Journals, 1917.	Sessional Papers, 1917.
Brought forward	460	170	202
Miscellaneous (United States)—*Concluded.*			
Law Library, Cornell University, Ithaca, N.Y.	1	.....	.....
Secretary, Department of Agriculture, Washington, D.C.	1	.....	.....
Library, Columbia University, New York	1	.....	1
State Historical Society of Wisconsin, Madison, Wisconsin	1	.....	1
Miscellaneous (Australasia)—			
State Parliamentary Library, Brisbane, Queensland	1	1	1
" " Melbourne, Victoria	1	1	1
" " Adelaide, South Australia	1	1	1
" " Perth, West Australia	1	1	1
" " Hobart, Tasmania	1	1	1
" " Wellington, N.Z.	1	1	1
Library of Parliament, Commonwealth of Australia, Melbourne, Victoria	1	1	1
Public Library of New South Wales, Sydney	1	1	1
Colonial Secretary, Singapore, S.S.	1	1	1
Library of Parliament, Cape Town, S.A.	1	1	1
Total number	474	180	214

DISTRIBUTION OF DOCUMENTS OF PREVIOUS YEARS.

To Whom Distributed.	1911.	R.S. 1911.	1912.	1913.	1914.	1915.	1916.	Totals.
Statutes.								
D. A. MacRae, Dean, Dalhousie University, Halifax, N.S.	.....	1	.....	.....	.....	.....	.....	1
G. W. Thomas, J.P., Coghlan, B.C.	.....	.....	.....	.....	1	.....	.....	1
Attorney-General's Department	.....	.....	.....	.....	.....	.....	2	2
Dr. R. M. Coulter, Deputy Postmaster, Ottawa	.....	.....	.....	.....	.....	1	.....	1
W. D. Scott, Superintendent of Immigration, Ottawa	.....	.....	.....	.....	.....	1	.....	1
The Hon. the Premier, Victoria	1	.....	.....	.....	.....	.....	1	2
W. J. Quinlan, S.M., Ocean Falls, B.C.	.....	1	1	1	1	1	.....	5
Deputy Minister of Justice, Ottawa	.....	.....	.....	.....	.....	.....	1	1
Agricultural Credit Commission, Victoria	.....	.....	.....	.....	.....	.....	1	1
King's Printer, Halifax, N.S.	.....	.....	.....	1	.....	.....	.....	1
The Hon. Provincial Secretary, Victoria	.....	.....	.....	.....	.....	.....	1	1
Major J. H. Lindsay, Estates Branch, Canadian Contingent, Westminster House, 7 Millbank, London, S.W.	.....	1	1	1	1	1	.....	5
Attorney-General's Department, Edmonton	.....	1	1	1	1	1	.....	5
J. W. Weart, M.P.P., Vancouver	.....	.....	.....	.....	.....	.....	1	1
The Hon. Attorney-General, Victoria	.....	1	.....	.....	.....	.....	1	2
A. B. Buckworth, J.P., Vancouver	.....	.....	.....	.....	1	1	1	3
R. C. McDonald, New Westminster	.....	.....	.....	.....	.....	.....	.....	.....
Hon. W. J. Sloan, Minister of Mines, Victoria, B.C.	.....	1	1	1	1	1	1	6
The Administrator, Government Office, Saint Lucia, B.W.I.	.....	1	.....	.....	.....	.....	.....	1
Bar Library, Royal Courts of Justice, London	.....	.....	.....	.....	.....	1	.....	1
	1	7	4	5	6	8	10	41

STATEMENT of the number of the Statutes, Journals, and Sessional Papers sold during the twelve months ending March 31st, 1917; showing also the amount of revenue received and paid into the Treasury for the same period.

Particulars.	No. of Copies Sold.	Amount Received.
Statutes, 1888	1	$ 2 50
" 1896	1	2 50
" 1908	2	5 00
" 1909	2	5 00
" 1910	2	5 00
" 1911	4	10 00
" 1912	17	41 00
" 1913	24	57 50
" 1914	25	60 50
" 1915	45	108 00
" 1916	388	886 00
Revised Statutes, 1911	17	323 00
" Vol. IV., 1911	22	101 00
Sale of other documents and advertising in B.C. Gazette	.....	38,086 36
Total revenue received	.....	$39,694 36

STATEMENT of number of bound British Columbia Gazettes distributed during year ended March 31st, 1917.

To Whom Distributed.	Year 1917.
Provincial Secretary	1
Executive Council	1
Speaker's Room	1
Legislative Library	1
Attorney-General's Office	1
Deputy Attorney-General	1
Minister of Lands	1
Deputy Minister of Lands	1
Lands Department (Front Office)	1
Lands Department (Mr. Cathcart)	1
Public Works Engineer	1
Assistant Public Works Engineer	1
Superintendent of Education	1
Water Rights Branch	1
Mines Department	1
Government Printing Office	2
Surveyor of Taxes	1
Surveyor-General	1
Department of Railways	1
Forest Branch	1
Inspector of Trust Companies	1
Agricultural Credit Commission	1
Registrar-General of Titles	1
Registrar of Titles, New Westminster	1
" Prince Rupert	1
" Vancouver	1
" Kamloops	1
" Nelson	1
Registrar, Supreme Court, Victoria	1
" " Vancouver	1
" County Court, "	1
" " New Westminster	1
" " Wilmer	1
Sheriff, New Westminster	1
District Forester, Vancouver	1
Government Agents :—	
Nanaimo	1
Vernon	1
Nelson	1
Duncan	1
Rossland	1
Clinton	1
Grand Forks	1
Golden	1
Cranbrook	1
New Westminster	1
Revelstoke	1
Kamloops	1
Atlin	1
Cumberland	1
Barkerville	1
Alberni	1
Nicola	1
Hazelton	1
Fairview	1
Ashcroft	1
Prince Rupert	1
Princeton	1
Quesnel	1
Kaslo	1
Greenwood	1
150-Mile House	1
South Fort George	1
Fernie	1
Fort Fraser	1
Vancouver	1
Assessor and Collector, Victoria	1
Mining Recorder, Slocan	1
" Trout Lake	1
" New Denver	1
Total	74

FINANCIAL STATEMENT, 1916-17.

(1st April, 1916, to 31st March, 1917.)

Amount paid for Salaries	$ 87,887 60	
" " Material, Paper, etc	40,316 36	
		$ 128,203 96
Revenue received		39,694 36

STATEMENT OF WORK DONE IN THE PRINTING AND BINDING DEPARTMENTS DURING THE 12 MONTHS ENDING MARCH 31ST, 1917.

Agricultural Department	$ 11,377 65	
Assessor	2,304 95	
Attorney-General's Department	1,214 72	
" " Boys' Industrial School $52.55		
" " Girls' " 36.75	89 30	
Audit Department	1,241 85	
B.C. Gazette	10,464 30	
Births, Deaths, and Marriages	559 85	
County Court	261 10	
Dykes Department	232 77	
Education Department	9,702 85	
B.C. University	372 35	
Fisheries Department	1,200 30	
Forest Branch	5,017 79	
Government Agents	816 15	
Game Wardens	453 70	
Health Department	1,518 05	
Inspector of Legal Offices	177 50	
Inspector of Trust Companies	132 30	
Inspector of Factories	16 55	
Inspector of Machinery	281 45	
Information Bureau	459 75	
Insurance Department	1,161 75	
Lands Department	728 23	
Land Registry Offices	2,238 10	
Legislation	10,482 65	
Library	712 97	
Lieutenant-Governor	193 50	
Mental Hospital	318 45	
Mines Department	6,974 73	
Museum	122 40	
Provincial Secretary's Department	2,015 62	
Provincial Police Department	707 77	
Provincial Home	1 20	
Provincial Gaol	88 65	
Premier's Office	112 55	
Printing Department	442 05	
Road Superintendents	58 50	
Railway Department	479 80	
Registrar of Companies	387 40	
Surveyor of Taxes	207 95	
Sheriff	57 53	
Supreme Court	587 12	
Surveys	1,366 34	
Treasury Department	5,693 15	
Water Rights Branch	557 00	
Works Department	1,434 53	
Miscellaneous Stock	1,807 55	
Agricultural Credit Commission	1,243 85	
Canadian Patriotic Fund	327 90	
Returned Soldiers Aid Commission	330 42	
Ship Building Commission	62 75	
Workman's Compensation Act	2,878 79	
		$ 91,676 43
Total revenue received		39,694 36

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

ANNUAL REPORT

OF

THE DEPARTMENT OF RAILWAYS

OF THE

PROVINCE OF BRITISH COLUMBIA

FOR YEAR ENDING DECEMBER 31ST

1917

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.

To His Honour Sir Francis Stillman Barnard, K.C.M.G.,

Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

Herewith I beg respectfully to submit Report for the Department of Railways for the year 1917.

JOHN OLIVER,

Minister of Railways.

Victoria, B.C., March 7th, 1918.

REPORT OF DEPARTMENT OF RAILWAYS.

VICTORIA, B.C., December 1st, 1917.

Hon. John Oliver,
Minister of Railways, Victoria, B.C.

SIR,—I have the honour to submit a report dealing with the activities of the Railway Department during the year ending December 31st, 1917.

The staff of the Department consists of Chief Engineer, Assistant Engineer, Inspector of Rolling Stock and Equipment, clerk, and stenographer.

In addition to railways proper, the Department has control over the Songhees terminal improvement-works and the maintenance and operation of the combined railway and highway bridge over the Fraser River at New Westminster, with its railway and highway approaches and connections.

Inspections of road-bed, structures, buildings, and equipment of railways operating under the jurisdiction of the Department have been made periodically during the year, and returns of the examination of train crews, etc., and of locomotive inspection have been made according to the rules and regulations of the Department.

All drawings of standard structures, etc., as required by the provisions of the Act, were placed before the Minister after examination, and received his approval.

CANADIAN NORTHERN PACIFIC RAILWAY.

Construction of the terminals of the company has been prosecuted throughout the year, and estimates have been proved for payment in accordance with the provisions of section 7 of the "Canadian Northern Pacific Railway Terminals Act, 1913," as detailed hereunder:—

Estimate No. 29.	January	$ 171,705 23
„ 30, 31.	February and March	196,549 78
„ 32.	April	124,894 50
„ 33.	May	356,515 83
„ 34.	June	252,188 05
„ 35.	July	122,833 65
„ 36.	August	167,547 40
„ 37.	September	147,003 75
„ 38.	October	105,594 53
„ 39.	November	223,740 67
„ 40.	December	96,234 78
	Total	$1,964,808 17

The position as to the terminals as at December 31st, 1917, is shown by the following statement:—

	Estimated Total Cost each Terminal.	Total Cash available each Terminal.	Proportion of Work now done.	Amount now earned.	Retentions.	Amount paid.
Vancouver	$4,308,455 10	$4,262,363 21	0.59193	$2,523,020 55	$94,298 30	$2,428,722 25
New Westminster	2,202,601 50	2,179,113 97	0.80008	1,743,465 55	...	1,743,465 55
Port Mann	1,213,424 62	1,200,570 16	0.93184	1,118,739 15	...	1,118,739 15
Steveston	353,988 89	349,996 73	0.8197	286,892 54	...	286,892 54
Patricia Bay	209,908 29	208,008 39	0.9846	204,804 68	...	204,804 68
Victoria	853,125 00	843,790 55	...	...	...	...
Totals	$9,141,503 40	$9,043,843 01	...	$5,876,922 47	$94,298 30	$5,782,624 17

The following statement shows in detail the right-of-way matters outstanding since 1913 adjusted by this Department during the year:—

Division.	Plan.	Lot.	Subdivision.	Area affected in Acres.			Remarks.
				Free.	For Sale.	Total.	
Y.H.P....	Mile 433	7384	S.E. ¼	12.49	19.80	32.29	South end of ballast-pit.
„ ...	„	7384	N.E. ¼ ...	3.49	12.30	15.79	
„ ...	„	7375	S.W. ¼ ...	0.72	...	0.72	
„ ...	„	7375	N.W. ¼ ...	9.40	6.41	15.81	
„ ...	„	7374	...	11.85	15.56	27.41	North end of ballast-pit to
„ ...	Mile 445	7373	...	7.38	7.38	14.76	Canoe River.
„ ...	„	7372	S.W. ¼ ...	1.36	1.35	2.71	
„ ...	„	7372	S.E. ¼ ...	4.94	4.94	9.88	
„ ...	„	7372	N.E. ¼ ...	6.67	6.68	13.35	
„ ...	„	7365	E. ½	6.95	6.94	13.89	
„ ...	„	7366	W. ½	7.53	7.54	15.07	
„ ...	„	7366	N.E. ¼ ...	2.88	2.88	5.76	
„ ...	„	7361	S.E. ¼ ...	9.62	4.39	14.01	
„ ...	„	7361	N.E. ¼ ...	11.58	2.12	13.70	
„ ...	„	7357	S.E. ¼ ...	3.43	3.42	6.85	
„ ...	Mile 58	7357	N.E. ¼ ...	1.76	1.75	3.51	
„ ...	„	Unsur	veyed.	5.27	5.28	10.55	
„ ...	„	7356	...	4.11	4.10	8.21	
„ ...	„	5708	N.E. ¼ ...	6.98	6.99	13.97	
„ ...	„	5707	S.E. ¼ ...	6.45	6.45	12.90	
„ ...	„	5707	N.E. ¼ ...	1.05	1.04	2.09	
„ ...	„	5707	N.W. ¼ ...	5.66	5.65	11.31	Swift Creek Siding.
			Totals...	131.57	132.97	264.54	
Y.H.P....	Miles 339 to 351	2612	...	1.20	2.20	3.40	North Thompson River to Sta. 704.94.
„ ...	Do.....	2613	...	4.26	7.05	11.31	Sta. 704.94 to 687.90.
„ ...	„	Unsur-	...	0.76	1.39	2.15	„ 687.90 to 685.23.
„ ...	„	veyed.	...	1.88	0.74	2.62	„ 677.84 to 673.18.
„ ...	„	Do....	...	8.49	5.75	14.24	„ 659.57 to 630.00.
„ ...	„	„ ...	...	2.72	1.32	4.04	„ 630.00 to 618.22.
„ ...	„	„ ...	...	2.35	1.00	3.35	„ 587.39 to 579.19.
„ ...	„	„ ...	...	9.56	4.25	13.81	„ 548.48 to 511.45.
„ ...	„	„ ...	...	4.06	1.10	5.16	„ 503.20 to 491.40.
„ ...	„	„ ...	...	3.81	2.66	6.47	„ 465.73 to 452.45.
„ ...	„	„ ...	...	3.30	0.62	3.92	„ 324.67 to 310.18.
„ ...	„	„ ...	...	5.66	5.60	11.26	„ 302.56 to 277.90.
„ ...	„	„ ...	...	4.01	1.57	5.58	„ 271.00 to 254.99.
„ ...	„	„ ...	...	5.54	1.23	6.77	„ 242.72 to 224.06.
„ ...	„	„ ...	...	7.75	4.00	11.75	„ 207.69 to 185.16.
„ ...	„	„ ...	...	11.65	8.81	20.46	„ 173.64 to 139.81.
„ ...	„	„ ...	...	3.14	1.51	4.65	„ 144.15 to 103.23.
			Totals...	80.14	50.80	130.94	
Y.H.P....	Miles 470	Unsur-	...	5.60	4.35	9.95	Sta. 1306.60 to 1359.69.5.
„ ...	to 500	veyed.	...	3.43	3.43	6.86	E. end of Grantbrook Sdg.
„ ...	Do.....	Do....	...	13.26	12.03	25.29	Sta. 584.70 to 525.05.
„ ...	„	„ ...	...	10.70	10.27	20.97	„ 509.08 to 462.15.
„ ...	„	„ ...	...	4.81	4.81	9.62	„ 447.84 to 405.95.
„ ...	„	„ ...	...	2.61	2.60	5.21	„ 391.88 to 369.19.
			Totals...	40.41	37.49	77.90	
Y.H.P....	Miles 351 to 354	2963	...	12.95	1.19	14.14	Sta. 9.76 to Zero and Zero to 9.10.
„ ...	Do.....	2963	...	6.44	4.21	10.65	Sta. 9.10 to 44.33.
„ ...	„	2963	...	6.45	0.64	7.09	„ 44.33 to 49.58.
„ ...	„	2963	...	3.53	1.07	4.60	„ 82.50 to 93.70.
			Totals...	29.37	7.11	36.48	
Y.H.P....	Miles 366	...	...	4.00	0.73	4.73	Sta. 905.02 to 914.11.
„ ...	to 377	...	...	19.54	0.69	20.23	„ 935.00 to 978.71.
„ ...	Do.....	...	...	12.97	...	12.97	„ 1181.80 to 1210.72.
			Totals...	36.51	1.42	37.93	

Summary.

Free Grant.	For Sale.	Total.
80.14	50.80	130.94
29.37	7.11	36.48
36.51	1.42	37.93
131.57	132.97	264.54
40.41*	37.49	77.90
318.00	229.79	547.79

WESTMINSTER BRIDGE.

This bridge, together with highway approaches, has been kept in thorough repair and at the highest state of efficiency.

An extension of the interlocking system has been arranged as between the Government, the Canadian Northern Pacific Railway, and Great Northern Railway at a joint expenditure of about $3,043, and the same is expected to be installed in March next.

The railroad traffic across this bridge for the year 1917 was as follows:—

Railways.	PASSENGER.		FREIGHT.		MIXED.	
	Trains.	Cars.	Trains.	Cars.	Trains.	Cars.
Great Northern	2,186	15,043	806	16,772	914	7,183
Canadian Northern Pacific	1,035	5,231	1,215	16,693	...	...
B.C. Electric	3,070	6,471	1,340	10,642	713*	2,047*
Canadian Pacific	...	...	...	3,376	...	...
Chicago, Milwaukee & St. Paul	...	...	...	161	...	...
Northern Pacific	...	...	...	587	...	...
Totals	6,291	26,745	3,361	48,231	1,627	9,230

* Dairy.

For the purpose of checking up approximately the maximum vehicular traffic crossing the bridge, count was taken as follows:—

Date.	Autos.	Auto-cycles.	Trucks.	Wagons.	Total.
Aug. 31, 8 a.m. to 12 p.m.	474	12	9	195	690
Aug. 31, 12 p.m. to Sept. 1, 12 p.m.	831	27	17	85	960
Sept. 1, 12 p.m. to Sept. 2, 12 p.m.	1,123	37	10	22	1,192
Sept. 2, 12 p.m. to Sept. 3, 12 p.m.	1,286	47	8	62	1,403
Totals	3,714	123	44	364	4,245

SONGHEES TERMINALS.

The work of grading the former Songhees Indian Reserve was reorganized in the beginning of the year, and a steam-shovel put on the ground, together with a compressor and equipment, for economically removing the rock. This work has been continuously carried on during the year, resulting in the removal of 33,774 cubic yards of rock at a total cost of $44,142.77, or an average of $1.31+ per cubic yard (details shown below), and producing a graded area suitable for large industrial sites.

On June 1st last a large area (portion of it being improved) and fronting on the harbour was leased to the Imperial Munitions Board (Wooden-ship Building Department) at the nominal rental of $275 per month for the purpose of assisting in the building of ships for the Imperial Government, and the success of the industry shows that in leasing the lands for such purpose the community has benefited very largely.

The lease expires on May 31st, and is renewable from month to month so long as required for ship-building for the Imperial Government.

A spur line connecting the Ship-building Company's wharf at Hospital Point with the Esquimalt & Nanaimo Railway Company's line has been constructed and is in operation. The Government contributed $1,000 toward the cost of this work.

Cost of Excavation, 1917.

Month.	Yardage.	Cost.	Per Yard.
January and February (reorganization)	...	...	...
March	3,661	$5,112 56	$1.40
April	4,945	6,146 56	1.243
May	5,477	6,877 65	1,256
June	3,808	4,811 65	1.263
August	2,521	3,221 78	1.277
July	2,903	3,663 60	1.262
September	2,449	3,411 39	1.392
October	3,174	4,370 53	1.377
November	3,012	4,066 98	1.35
December	1,824	2,460 07	1.348
Totals	33,774	$44,142 77	Ave. 1.31+

The average cost per cubic yard for removing the same class of material in 1916 was $2.52½. Comparing this cost, therefore, with the above, a saving in the management of this work has been effected amounting to $40,866.14.

A list of the Minister's certificates issued in accordance with the provisions of the Act and referring to all such matters connected with railways as provided for therein is given in Appendix A.

Accidents which have occurred on railways under the jurisdiction of this Department and reported as required by the Act are stated in Appendix B.

A list of the railways incorporated under Acts of the Legislature of British Columbia since 1883 is given in Appendix C.

A partial list of the companies operating logging-railways, with their mileages, etc., is given in Appendix D.

A list of the plans approved and sanctioned during the year 1917 is given in Appendix E.

Balance-sheets, in accordance with the provisions of the "Railway Act," have been filed by the following railway companies:—

Comox Logging Railway Company.
Crow's Nest Southern Railway Company.
British Columbia & Yukon Railway Company.
Victoria Terminal Railway & Ferry Company.
Victoria & Sidney Railway Company.
Menzies Bay Railway Company.
New Westminster Southern Railway.
Penticton Railway Company.
Pacific Great Eastern Railway.

I have the honour to be,
Sir,
Your obedient servant,
A. F. PROCTOR,
Chief Engineer.

APPENDICES.

APPENDIX A.

Certificates.

Cert. No.

Canadian Northern Pacific Railway—
- Granting extension of time to complete railway from Victoria to Union Bay to March 1st, 1917 399
- Granting extensions of time—
  - (1.) For the completion of lines of railway mentioned in subsections (*a*) and (*b*), section 3, chapter 32, 1912, from February 27th, 1917, to July 1st, 1917 402
  - (2.) For the completion of lines of railway mentioned in subsections (*a*) and (*b*), section 2, chapter 57, 1913, from February 1st, 1917, to July 1st, 1917 402
- Granting extension of time for completion of line of railway mentioned in subsection (*b*), section 4, of the Schedule to chapter 3, 1910, from Victoria towards Barkley Sound, to July 1st, 1917 403
- Granting extension of time to complete railway from Victoria to Union Bay as described in subsection (*c*), chapter 57, 1913, to May 1st, 1917 405
- Direction to erect and maintain fences, gates, and cattle-guards between Tranquille Station and Copper Creek Station, County of Yale, as provided in subsection (4), section 172, "British Columbia Railway Act," R.S.B.C. 1911 406
- Ordering company to erect and maintain fences between certain mileages.. 414
- Granting authority to carry traffic over railway between Alpha Street, Victoria, and Patricia Bay, North Saanich 415
- Granting application for permission to run free train from New Westminster to Port Mann for benefit of employees in New Westminster... 416
- Granting extension of time for completion of railway between Victoria and Union Bay to November 1st, 1917 419
- Granting application to operate railway from Port Kells to New Westminster Bridge 425
- Granting application for approval of plan of 120-foot deck Howe truss 428
- Granting application for approval of plan of 60-foot deck Howe truss 429

Capilano Timber Co., Ltd.—
- Instructions in reference to the installation and protection of the diamond crossing of the above-named company over the tracks of the Pacific Great Eastern Railway 417
- Granting approval of plan and profile of the junction of this company's line of railway with the Pacific Great Eastern Railway, North Vancouver.. 421

Grouse Mountain Scenic Incline Railway Co.—
- Granting extension of time to complete and put in operation its line of railway until April 1st, 1919 409

Menzies Bay Railway—
- Granting extension of time for completion of railway to March 28th, 1918.. 408

Naas & Skeena Rivers Railway—
- Granting extension of time to May 31st, 1918 412

North Vancouver Island Railway—
- Granting extension of time for completion of line until March 28th, 1918.. 407

Cert. No.

Pacific Great Eastern Railway—
Ordering a minimum supply of cars to handle traffic originating on the line from the sawmill of Messrs. Stewart & Wade 418
Granting right-of-way through Crown lands lying between Miles 0.43 and 31.12, Horse Lake Summit North 420
Granting right-of-way through Crown lands lying between Mile 0 to Mile 39.15, Fort George South, and Mile 0 to Mile 21.74, Hixon Creek South 423
South-East Kootenay Railway—
Granting extension of time to complete to February 27th, 1918 401
(Vancouver Power Co., Ltd.) B.C. Electric Railway Co.—
Ordering that subsection (*b*) of Rule 7 of the Rules, Regulations, and Instructions issued by the Department be amended and become effective 410
Permission granted to join its tracks with the tracks of the Canadian Northern Pacific Railway Co. in Lot 27A, Township 26, Municipality of Chilliwack 411
Permission granted the Corporation of the District of Burnaby to construct road crossing over the tracks of the B.C. Electric Railway Co. at Mission Avenue 413
Permission granted to Municipality of Surrey to cross the tracks of the B.C. Electric Railway Co. at Clow Road 422
Permission for the Timberland Lumber Co., Ltd., to operate their spur line connecting with the B.C. Electric Railway Co. 424
Permission granted for the Smith-Hutchison Lumber Co. to operate their spur line connecting with the B.C. Electric Railway Co. 426
Permission granted for the B.C. Telephone Co. to carry its wires under the tracks of the B.C. Electric Railway Co. at: (*a*) Newton Road, Surrey; (*b*) Scott Road, Surrey; (*c*) Scott Road, Scott Station, Surrey 430
Permission granted for the Beaver River Lumber Co. to operate its spur connecting with the B.C. Electric Railway Co. 431
Wellington Colliery Railway—
Granting permission to operate this line at a speed of 35 miles per hour from a point on the line of railway of the Wellington Colliery Co. near Trent River to a point near Puntledge River, Vancouver Island 427
Miscellaneous—
Railway Safety Rules and Regulations *re*—
(1.) Pipes crossing beneath tracks of railways.
(2.) Fire-protection appliances on locomotives.
(3.) Steam leaks, air-brakes, and wheel defects and springs on locomotives.
(4.) Wires crossing railways.
(5.) Rules affecting highway crossings.

APPENDIX B.

Accident Reports, 1917.

Accident.	Nature of Accident.	Cause of Accident.
B.C. Electric Rly.		
Chinaman	Died of injuries	Collision with rig.
Hindoo	Killed instantly	Lying on track.
Man	Died of injuries	Struck by car.
„ employee	Arm broken	Car collision.
Lady, passenger	Shock and bruises	„
Man	Broken pelvis-bone and shock	Slipped while boarding moving car.
Lady	Badly bruised	Struck by car.
Man, passenger	Injury and clothing damaged	Car collision.
„ „	Injury and shock	„
Lady, „	Injury to head	„
Man „	Slight injury	„
Chinaman	Artery of right leg broken	Car struck rear of dump-cart; horse bolted, throwing Chinaman.
Man	Wound on head	Bicycle collided with side of street-car.
Lady, passenger	Bad bruise on knee	Car collision.
Man, „	Back injured	„
„ employee	Shaken up	„
„	Killed	Struck by train.
„	„	Jumped or was thrown from auto which struck interurban car.
Boy	Right leg badly crushed below the knee (amputation)	Hanging on side of car while riding cycle, slipped, he fell, rear truck passing over his leg.
Lady, passenger	Varicose condition of leg	Jar when switch split, threw her against a seat.
Man, employee	Injured back	Run over by auto-truck.
„	Fractured skull	Struck by car.
Lady	Broken arm	„ „
Boy	Died of injuries	„ „
Man	Fractured skull; fatal	Struck by car and fell, striking head.
Comox Logging Railway.		
Man, employee	Fatal	Slipped while stepping from flat car to locomotive.
Crow's Nest Southern Railway.		
Man, employee	Badly sprained ankle	While switching, struck foot against wood which projected from pile on side of track.
„ „	Piece of hay in eye	While loading hay, piece blew in his eye.
„ „	Back of hand bruised	Struck on hand by spike which glanced off maul.
„ „	Bruised toe	Riprapping, rock rolled on foot.
„ „	Hand slightly bruised	Riprapping, caught hand between rocks.
„ „	Foot slightly bruised	Tie fell on foot.
Great Northern Railway.		
Man, employee	Left ankle sprained	Getting off car while in motion.
„ „	Bruise and contusion of hand	Struck by pick.
„ „	Infection and swelling of right hand	Wheel slipped while starting gasolene-engine.
„ „	Scalp-wounds and contusion of shoulder	While pumping hand-speeder, coat caught in wheel, throwing him off and striking head on tie.
„ „	Toe bruised	While moving timbers over pile of lumber, timber slipped and struck his toe.

APPENDIX B—*Concluded.*

ACCIDENT REPORTS, 1917—*Concluded.*

Accident.	Nature of Accident.	Cause of Accident.
Western Fuel Co.		
Man, employee	Ruptured muscle, right thigh	Thigh pinched between bumpers of cars.
„ „	First finger badly cut	Head came off hammer while breaking coal.
„ „	Badly bruised leg, shoulder, and minor cuts about head and face	Train wreck.

APPENDIX C.

RAILWAYS INCORPORATED UNDER ACTS OF THE LEGISLATURE OF BRITISH COLUMBIA SINCE 1883.

Name of Railway.	Cap.	Year.	Remarks.
Adams River Rly.	30	1903	Lapsed.
Alice Arm Rly.	46	1898	„
Ashcroft & Cariboo Rly.	40	1890	„
„ „	60	1890	„
„ „	52	1891	„
„ „	52	1896	„
Ashcroft, Barkerville & Ft. George Rly.	49	1906	„
Arrowhead & Kootenay Rly.	47	1898	„
„ „	65	1901	„
Atlin Short Line Rly. & Navigation Co.	79	1899	„
Atlin Southern Rly.	80	1899	„
Barkerville, Ashcroft & Kamloops Rly.	46	1897	„
Beddington & Nelson Rly.	47	1897	Declared for public benefit, c. 53, 1899.
Beddington & West Kootenay Rly.	46	1893	Lapsed.
Bentinck Arm & Quesnel Rly.	48	1907	„
Bella Coola & Fraser Lake	50	1906	„
British Columbia & Alaska Rly.	56	1910	„
British Columbia & Northern	32	1903	„
Mackenzie Valley Rly.	53	1906	„
British Columbia Central	51	1906	„
„ „	57	1910	„
British Columbia Northern & Alaska Rly.	52	1906	„
British Columbia Southern	36	1893	Amended, c. 47, 1893; repealed, c. 53, 1894; c. 39, 1894; c. 4, 1896; c. 53, 1896; c. 33, 1897. Declared for public benefit, c. 36, 1897.
British Columbia Electric Rly.—			
Vancouver Street Rly.	31	1886	Lapsed.
„ „	38	1889	Incorporation.
Vancouver Electric Rly. & Light Co.	51	1890	Amendment.
National Electric Tramway & Light Co.	39	1889	Victoria Electric Rly. & Light Co., c. 63, 1894.
Ditto	52	1890	Amendment.
Westminster Street Rly.	65	1890	
Westminster & Vancouver Tramway Co.	67	1890	Amended.
British Columbia Electric Co.	49	1890	} Act to amalgamate Westminster Street Rly. &
„ „	71	1891	} Westminster & Vancouver Tramway Co.
„ „	51	1894	Amendment. Land grant.
Consolidated Rly. & Light Co.	56	1894	Incorporation.
„ „	55	1896	Amendment.
Victoria Electric Rly. & Light Co.	63	1894	City of Victoria to supply light and power.
Victoria & British Columbia Electric Rly. Co. Agreement	81	1897	Supply electric light and power in and around City of Victoria.
British Columbia Yukon Rly.	49	1897	Operating.
Burrard Inlet & Fraser Valley Rly.	54	1891	Amended, c. 48, 1893, and c. 59, 1895. Lapsed.
Burrard Inlet Rly. & Ferry Co.	53	1891	Lapsed.
Canadian North-eastern Rly.	74	1911	„
Canadian Northern Rly.	48	1892	„
„ „	3	1910	*Main Lines.*—Agreement.
Canadian Northern Pacific Rly.	4	1910	(*a*) Yellowhead Pass to Vancouver, completed; (*b*) Victoria to Barkley Sound, time extended to July 1st, 1917.
„ „	32	1912	Barkley Sound to Nootka Sound, time extended to July 1st, 1917.
„ „	57	1913	*Branch Lines.*—(*a*) Westminster Bridge to Vancouver, time extended to July 1st, 1917; (*b*) Westminster Bridge to Steveston, time extended to July 1st, 1917; (*c*) Victoria to Patricia Bay, completed.

APPENDIX C—*Continued.*

RAILWAYS INCORPORATED UNDER ACTS OF THE LEGISLATURE OF BRITISH COLUMBIA SINCE 1883—*Continued.*

Name of Railway.	Cap.	Year.	Remarks.
Canadian Northern Pacific Rly. ..	58	1913	Amendment to c. 4, 1910.
„ „ ..	59	1913	*Terminals.*—Port Mann, New Westminster, Vancouver, Victoria, Steveston, and Patricia Bay.
„ „ ..	61	1914	Further aid toward construction.
„ „ ..	62	1914	Amendment to c. 57, 1913.
Canadian Pacific Rly.	11	1880	Land grant.
Canadian Western Central Rly. ..	20	1889	Land subsidy.
„ „ ..	34	1889	Incorporation. Amended, c. 40, 1890; c. 36, 1892; c. 39, 1893; c. 4, 1895; c. 34, 1897. Lapsed.
Canadian Yukon Rly.	50	1898	Lapsed.
Cariboo, Barkerville & Willow River Rly.	62	1910	„
Cariboo Rly. (Ashcroft & Cariboo)	55	1897	Amendment, c. 50, 1897. Lapsed.
Cassiar Central Rly.	35	1897	Crown grant.
„ „	52	1897	Incorporation. Lapsed.
Chilkat & Klehine Rly. & Navigation Co.	68	1901	Lapsed.
Chilliwack Rly.	55	1891	Declared for public benefit, c. 43, 1893.
Columbia & Carbonate Mountain Rly.	61	1890	Lapsed.
Columbia & Kootenay Rly.	21	1889	Land subsidy.
„ „	62	1890	Amended, c. 49, 1892; c. 60, 1895. Declared for public benefit, c. 89, 1890.
Columbia & Kootenay Rly. & Transportation Co.	25	1883	Amended, c. 24, 1884; c. 21, 1889; c. 41, 1890. Lapsed.
Columbia & Western Rly.	8	1896	Subsidy Act. Repealed, c. 8, 1903.
„ „	54	1896	Incorporation. Amended, c. 12, 1898; c. 14, 1899; c. 4, 1900; c. 70, 1901; c. 8, 1903; c. 9, 1906. Declared for public benefit, c. 61, 1898.
Coast-Kootenay Rly.	69	1901	Amended, c. 9, 1902. Declared for public benefit, c. 199, 1903.
Coast-Yukon Rly.	58	1904	Lapsed.
Comox & Cape Scott Rly.	71	1901	„
Comox Logging & Rly. Co.	63	1910	Operating.
Cowichan, Alberni & Fort Rupert Rly.	59	1904	Amended, c. 54, 1906. Lapsed.
Crawford Bay Rly.	72	1901	Lapsed.
Crow's Nest & Kootenay Lake Rly.	72	1888	Land grant.
„ „ „	44	1888	Incorporation. Amended, c. 63, 1890; c. 56, 1891. Repealed, c. 53, 1894. Lapsed.
Crow's Nest & Northern Rly.	58	1908	Amended, c. 64, 1911. Lapsed.
Crow's Nest Southern Rly.	73	1901	Operating (G.N. Rly. or V.V. & E. Rly.).
Delta, New Westminster & Eastern Rly.	57	1894	Amended, c. 54, 1897. Lapsed.
Dolly Varden Mines Rly.	..	..	Act, 1917. Time to complete, Dec. 31st, 1918.
Delta Rly.	34	1887	Lapsed.
Downie Creek Railway	52	1898	„
East Kootenay Logging Rly.	52	1907	Operating.
East Kootenay Rly.	61	1897	Lapsed.
East Kootenay Valley Rly.	53	1898	„
Eastern British Columbia Rly. ...	60	1908	Operating.
Esquimalt & Nanaimo Rly.	13	1875	Land grant. Repealed, c. 16, 1882. Amended, c. 28, 1888; c. 45, 1888.
„ „	26	1903	Settlers' Rights Act.
„ „	33	1912	Agreement. Amended, c. 60, 1913. Declared for public benefit, c. 90, 1905.
Flathead Valley Rly.	33	1903	Lapsed.
„ „	52	1909	„
Fording Valley Rly.	63	1905	„
Fraser River Rly.	26	1883	„
Graham Island Rly.	54	1909	

APPENDIX C—*Continued.*

Railways incorporated under Acts of the Legislature of British Columbia since 1883—*Continued.*

Name of Railway.	Cap.	Year.	Remarks.
Graham Island Rly.	65	1910	Amendment. Time extended to 1918.
Grand Trunk Pacific Rly.	19	1908	Crown grant. Amended, c. 22, 1909; c. 34, 1912. Operating.
Grouse Mountain Scenic Incline Rly.	66	1911	Time extended to April 1st, 1919.
Hall Mines, Ltd., Tramway Act	59	1894	Lapsed.
Hardy Bay & Quatsino Sound Rly.	55	1909	„
Harrison Hot Springs Tramway Co., Ltd.	47	1888	„
Hot Springs & Goat River Tramway	68	1891	„
Howe Sound, Pemberton Valley & Northern Rly.	53	1907	$5,000 deposit with Minister of Finance.
Howe Sound & Northern Rly.	67	1910	Amendment to c. 53, 1907. Amalgamated with Pacific Great Eastern Rly.
Hudson Bay Pacific Rly.	61	1908	Lapsed.
Imperial Pacific Rly.	77	1901	„
Island Valley Rly.	68	1910	„
Kamloops & Atlin Rly.	83	1899	„
„ „	48	1900	„
„ „	78	1901	„
Kamloops & Yellowhead Pass Rly.	58	1906	„
Kaslo & Lardo-Duncan Rly.	58	1897	„
Kaslo & Slocan Rly.	37	1892	Land grant.
„ „	52	1892	Incorporation. Amended, c. 41, 1894; c. 61, 1894; c. 36, 1897; C.P.R. was paid $100,000 for reconstructing Kaslo & Slocan Rly. (c. 37, 1912). Now operating.
Kaslo & Slocan Tramway Co.	52	1893	Lapsed.
Kettle River Valley Rly.	26	1910	Agreement.
„ „	35	1912	Ratify Agreement, Jan. 12th, 1912.
„ „	53	1912	By-law. Operating.
Kitimat Rly.	54	1898	Amended, c. 84, 1899. Lapsed.
Kootenay & North-west Rly.	55	1898	Amended, c. 85, 1899. Lapsed.
Kootenay Lake Shore & Lardo Rly.	53	1893	Lapsed.
Kootenay & Athabasca Rly.	25	1887	Land grant. Lapsed.
„ „	35	1887	Incorporation. Lapsed.
Kootenay, Cariboo & Pacific Rly.	34	1903	Lapsed.
Kootenay Central Rly.	79	1901	„
„ „	35	1903	Declared for the public benefit.
Kootenay Rly. & Navigation Co.	29	1888	Land grant. Lapsed.
„ „	46	1888	Change of title. Lapsed.
Columbia & Kootenay Rly. & Navigation Co.	35	1889	Lapsed.
Ladysmith Lumber Co. Rly.	62	1908	Operating.
Lake Bennett Rly.	80	1901	Lapsed.
Lardeau & Kootenay Rly.	54	1893	„
Lardeau Rly.	64	1897	„
Liverpool & Canoe Pass Rly.	57	1891	„
Meadow Creek Rly.	56	1909	Lapsed. $5,000 deposited with Minister of Finance.
Menzies Bay Rly.	69	1910	Time extended to March 28th, 1917.
Mid-Provincial & Nechako Rly.	68	1911	Lapsed.
Midway & Vernon Rly.	81	1901	Amended, c. 45, 1902. Repealed, c. 45, 1902. Amended, c. 36, 1904; c. 60, 1906. Lapsed.
Midway-Penticton Rly.	44	1899	
Morrissey, Fernie & Michel Rly.	37	1903	Lapsed.
Mountain Tramway & Electric Co.	56	1898	„
Mount Tolmie Park & Cordova Bay Rly.	55	1893	„
Naas & Skeena Rivers Rly.	69	1911	Amended, c. 79, 1916. Extension of time to May 31st, 1918.

APPENDIX C—*Continued.*

RAILWAYS INCORPORATED UNDER ACTS OF THE LEGISLATURE OF BRITISH COLUMBIA SINCE 1883—*Continued.*

Name of Railway.	Cap.	Year.	Remarks.
Nakusp & Slocan Rly.	56	1893	Amended, c. 43, 1894. Operated by C.P.R.
Nanaimo-Alberni Rly.	66	1897	Lapsed.
Nanaimo Electric Tramway Co.	69	1891	„
Nanaimo Rly. Act	25	1881	„
Nelson & Fort Sheppard Rly.	58	1891	Amended, c. 42, 1894; c. 37, 1897.
„ „	38	1892	Land grant. Declared for the public benefit, c. 57, 1893.
„ „	42	1894	Amended, c. 42, 1894; c. 37, 1897.
Nelson & Arrow Lake	57	1893	Lapsed.
New Westminster-Port Moody Rly.	14	1882	Amended, c. 25, 1884. Lapsed.
New Westminster & Vancouver Short Line Rly.	37	1889	Amended, c. 67, 1892; c. 60, 1896. Lapsed.
New Westminster Southern Rly.	27	1883	Lapsed.
„ „	36	1887	Amended, c. 36, 1889. Operating. G.N.P. purchased from Port Kells to Bridge, New Westminster. Since sold to Canadian Northern.
Nicola, Kamloops & Similkameen Coal & Rly. Co.	47	1891	Amended, c. 38, 1903. Declared for public benefit, c. 164, 1903.
Nicola Valley Rly.	59	1891	Declared for the public benefit.
„ „	37	1893	Chap. 50, 1892.
North Star & Arrow Lake Rly.	58	1898	Amended, c. 86, 1899. Lapsed.
Northern Vancouver Island Rly.	71	1910	
„ „	70	1911	Time extended to March 28th, 1918. $5,000 deposited with Minister of Finance.
Okanagan & Kootenay Rly.	40	1890	Lapsed.
„ „	64	1890	„
Osoyoos & Okanagan Rly.	59	1893	„
Pacific Great Eastern Rly.	34	1913	Amended, c. 61, 1913; c. 62, 1913; c. 65, 1914.
„ „	36	1912	Under construction.
Pacific Northern & Eastern Rly.	39	1903	Lapsed.
Pacific Northern & Omineca Rly.	50	1900	Amended, c. 55, 1902; c. 77, 1902; c. 40, 1903; c. 67, 1905; c. 58, 1909. Lapsed. Security deposited with Minister of Finance.
Pacific Rly.	73	1910	Lapsed.
Peace & Naas River Rly.	73	1911	„
Penticton Rly.	74	1910	„
Portland & Stickine Rly.	59	1898	„
Portland Canal Short Line	59	1909	Amended, c. 74, 1911. Now called Canadian Northeastern Railway. Abandoned.
Portland Canal Rly.	56	1907	Lapsed.
Port Moody, Indian River & Northern Rly.	75	1910	„
Prince Rupert & Port Simpson Rly.	60	1909	„
Quatsino Rly.	42	1903	„
Queen Charlotte Island Rly.	83	1901	Amended, c. 57, 1907.
„ „	63	1905	Lapsed.
Queen Charlotte Rly.	76	1910	„
Rainy Hollow Rly.	58	1907	„
Red Mountain Rly.	61	1893	Declared for public benefit, c. 60, 1895.
Revelstoke & Cassiar Rly.	61	1898	Lapsed.
Rock Bay & Salmon River Rly.	51	1900	„
St. Mary's & Cherry Creek Rly.	64	1906	
St. Mary's Valley Rly.	65	1906	
Shuswap & Okanagan Rly.	26	1887	Amended, c. 30, 1888; c. 42, 1890; c. 37, 1891.
Skeena River & Eastern Rly.	62	1898	Lapsed.
Skeena River Rly. Colonization & Exploration Co.	63	1898	„
South-east Kootenay Rly.	64	1898	„
„ „	63	1906	Amended, c. 61, 1909. Time extended to Feb. 27th, 1919.
South Kootenay Rly.	88	1898	Lapsed.
South Okanagan Rly.	66	1906	„

APPENDIX C—*Concluded.*

RAILWAYS INCORPORATED UNDER ACTS OF THE LEGISLATURE OF BRITISH COLUMBIA SINCE 1883—*Concluded.*

Name of Railway.	Cap.	Year.	Remarks.
Stave Valley Rly.	70	1905	Lapsed.
Stickeen & Teslin Rly. Navigation & Colonization Co.	71	1897	„
Toad Mountain & Nelson Tramway Incorporation	70	1891	Amended, c. 44, 1898; c. 40, 1900.
Toad Mountain & Nelson Tramway Incorporation	185	1897	Chap. 58, 1901, an Act respecting the Incorporation of Tramway, Telephone, and Telegraph Companies.
Tramway Inspection	50	1910	Amended, c. 51, 1911.
Upper Columbia Navigation & Tramway Co.	50	1891	
Vancouver & Grand Forks Rly.	84	1901	Lapsed.
Vancouver & Lulu Island Electric Rly. & Improvement Co.	61	1891	„
Vancouver & Lulu Island Rly.	60	1891	Amended, c. 73, 1897; c. 52, 1900. Declared for public benefit, c. 86, 1901.
Vancouver & Nicola Valley Rly.	63	1908	Amended, c. 80, 1910. Lapsed.
Vancouver & Northern Rly.	64	1909	Lapsed.
Vancouver & Westminster Rly.	53	1900	Amended, c. 78, 1902.
Vancouver Island Hydro-electric & Tramway Co., Ltd.	..	..	Incorporated, joint-stock company, Nov. 12th, 1912. Lapsed.
Vancouver Land & Rly. Co.	15	1882	Lapsed.
Vancouver-Nanaimo Rly. Transfer Co.	74	1897	„
Vancouver, Northern & Yukon Rly.	89	1899	Amended, c. 55, 1900. Lapsed.
Vancouver, Northern, Peace River & Alaska Railway & Navigation Co.	62	1891	Lapsed.
Vancouver, Victoria & Eastern Rly. & Navigation Co.	75	1897	Declared for public benefit, c. 172, 1905.
Vernon & Okanagan Rly.	63	1891	Lapsed.
Victoria & Barkley Sound Rly.	65	1909	„
Victoria & Northern America Rly.	64	1891	„
Victoria & Saanich Rly.	16	1886	„
„ „	29	1886	„
Victoria & Seymour Narrows Rly.	79	1902	„
Victoria & Sidney Rly.	39	1892	Subsidy. } Operated by G.N.R.
„ „	66	1892	Incorporation. }
Victoria & Yellowhead Pass Ry. Aid	70	1902	Lapsed.
Victoria Terminal Rly. & Ferry Co.	85	1901	Amended, c. 54, 1905. } Operated by G.N.R.
„ „ „	86	1901	By-law. }
Victoria, Vancouver & Westminster	64	1894	Amended, c. 76, 1897. Lapsed.
Wellington Colliery Rly.	28	1883	Lapsed.
„ „	44	1911	Operating.
Yale Northern Rly.	87	1901	Lapsed.
Yukon Mining, Trading & Transportation Co.	38	1897	
Ditto	77	1897	Lapsed.
Victoria Harbour Rly. Co.	44	1911	„

APPENDIX D.

PARTIAL LIST OF TIMBER COMPANIES OPERATING LOGGING-RAILWAYS.

Name of Railway.	No. of Miles.	Locos.	Equipment.
Abbotsford Timber Co.	8½	1	17 Hercules steel logging-trucks, 1 flat car.
Allison, A. P.	6*	1	7 cars.
Anderson, P. B.	..	1	Not operating at present.
Adolph Lumber Co.	2	1	16 flat cars.
British America Mills & Timber Co., Ltd.	4	1	10 logging-trucks, 2 flat cars.
B.C. Mills Timber & Trading Co.	27	7	133 logging-trucks, 5 flat cars, 2 speeders.
Beaver River Lumber Co.	4	2	8 sets trucks, 1 wood car, 2 tank cars.
Bloedel, Stewart & Welch, Ltd.	8½	2	4 Seattle Hercules trucks, 6 standard flat cars, 15 connected logging-cars, 8 sets trucks.
Brooks, Scanlan & O'Brien Co., Ltd.	5	1	16 flat cars, 1 box car.
Campbell River Lumber Co.	2	1	8 skeleton trucks.
Canadian Puget Sound Lumber Co., Ltd.	7	3	60 logging-trucks, 3 flat cars.
Canadian Robert Dollar Co., Ltd.	5½	1	18 logging-trucks.
Capilano Timber Co.	7	2	28 logging-trucks.
Craig & Taylor	3¼	1	
Comox Logging & Railway Co.	45	6	15 logging-trucks, 200 flat cars, 2 speeders.
Columbia River Lumber Co.	25	3	100 logging-cars, 2 box cars, 2 flat cars, 38,000-gallon fuel-oil tank cars.
Crow's Nest Pass Lumber Co.	5	2	40 flat cars.
Delta Shingle Co.	..	1	
East Kootenay Lumber Co.	..	2	
Feraridge Lumber Co.	..	1	
Forrest Mills of B.C., Ltd.	23	5	44 logging-trucks.
Galbraith & Son	3	1	4 "
Gordon Development Co.	2	1	
Heaps Co.	11½	1	15 logging-trucks, 4 flat cars, 3 oil-tanks, 2 water-tanks.
Howard, W. H.	..	1	
Hutchinson & Smith	..	1	
International Timber Co.	20	3	50 sets logging-trucks, 10 flat cars, 2 speeders.
Iowa Lumber & Timber Co., Ltd.	..	1	
Keystone Logging Co.	6	1	20 logging-trucks, 1 flat car, 1 speeder.
King, M. B., Lumber Co.	3	1	6 logging-trucks.
Khaka Int. Trading Co.	2¼	1	6 trucks.
Lamb Lumber Co.	3½	1	12 trucks.
Ladysmith Logging Co.	6	2	4 flat cars.
Mayo Lumber Co.	1	1	6 logging-cars.
Mainland Cedar Co.	2½	1	6 logging-cars, 1 flat car.
Merrill-Ring Lumber Co.	1½	1	
Moore Logging Co.	..	1	
McNair, Robt., Shingle Co.	8½	1	12 trucks, 6 flat cars, 7 speeders.
New Ladysmith Lumber Co., Ltd.	9	2	10 flat cars.
Nimpkish Timber Co.	5¼	1	9 logging-trucks, 1 flat car.
Otis-Staples Lumber Co., Ltd.	34	3	85 trucks, 4 flat cars, 2 tank cars, 2 speeders.
Powell River Co., Ltd.	16	2	34 sets logging-trucks, 3 flat cars, 4 speeders.
Salmon River Lumber Co.	2	1	6 logging-trucks.
Shawnigan Lake Lumber Co.	6	2	20 "
Southgate Logging Co.	4½	2	
Sidney B. Smith Lumber Co.	..	1	
Straits Lumber Co., Ltd.	9	1	16 logging-trucks.
Squamish Timber Co.	4	1	8 sets logging-trucks.
Seaboard Logging Co.	3	1	16 logging-trucks, 3 flat cars.
Surrey Shingle Co.	..	1	
Stuart & Scribner	..	1	
Sylvania Logging Co.	3	1	4 logging-trucks.
Smith-Hutchinson Lumber Co., Ltd.	1½	1	2 "
Strong, Jushua Y.	3¾	1	15 "
Timberland Lumber Co.	4	1	5 flat cars.

* One mile laid, two miles graded, and three miles under construction.

APPENDIX 1D—*Concluded.*

PARTIAL LIST OF TIMBER COMPANIES OPERATING LOGGING-RAILWAYS—*Concluded.*

Name of Railway.	No. of Miles.	Locos.	Equipment.
Vancouver Lumber Co.	3	1	7 logging-trucks.
Victoria Lumber Co.	21	4	70 logging-trucks, 3 flat cars, 1 speeder.
West Logging Co.	4½	1	8 logging-trucks.
Warren Timber Co.	..	1	
Westholme Lumber Co.	6	1	25 logging-trucks, 1 flat car, 1 speeder.
Wilson Brady, Ltd.	7	1	14 logging-trucks, 1 flat car, 1 speeder.
Wilson Logging & Timber Co. ..	5½	1	
Totals	410½	98	

APPENDIX E.

PLANS APPROVED AND SANCTIONED DURING YEAR 1917.

B.C. Electric Railway—

No. 728. Level crossing at Mission Avenue, D.L. 96, Burnaby.
„ 729. Interchange track with C.N.P. Railway at Chilliwack.
„ 704. Crossing of C.N.P. Railway at Mile 13.7, Saanichton.
„ 732. Crossing of high transmission-line over V. & S. Railway at town of Sidney.
„ 737. Spur to Timberland Co.'s mill at Craigs.
„ 738. Spur to Smith & Hutchinson Sawmill, Bradner.
„ 741. Under-crossing of cable at Scott Road, near Kennedy Station, Surrey Municipality.
„ 742. Under-crossing of cable at Scott Road, close to Scott Station, Surrey Municipality.
„ 743. Under-crossing of cable at Newton Road, close to Newton Station, Surrey Municipality.
„ 744. Spur to Beaver River Lumber Co. mill at Beaver River Station.

Canadian Northern Pacific Railway—

No. 739. Standard 120-foot deck Howe truss.
„ 740. Standard 60-foot deck Howe truss.

Capilano Timber Co.—

No. 40. Diamond crossing over tracks of Pacific Great Eastern Railway.

Pacific Great Eastern Railway—

No. 733. Right-of-way, Mile 22.20 to 4.11.
„ 734. „ „ 4.11 to 0.00.
„ „ „ „ 39.15 to 30.97.
„ 735. „ „ 30.97 to 14.05.
„ 736. „ „ 14.05 to 0.00.

Songhees Reserve—

No. 102. Plan of land leased to Imperial Munitions Board, Wooden-ship Building Department.
„ 101. Plan showing spur of E. & N. Railway to connect with Cameron-Genoa Shipyards.
„ 112. Plan showing rearrangement of B.C. Telephone Company's lines across reserve.
„ 113. Plan of E. & N. Railway spur to Foundation Company's yard.

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